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ADVERTISEMENT.

The extension of the scope of the National Museum during the past few years, and the activity of the collectors employed in its interest, have caused a great increase in the amount of material in its possession. Many of the objects gathered are of a novel and important character, and serve to throw a new light upon the study of nature and of man.

The importance to science of prompt publication of descriptions of this material led to the establishment, in 1878, of the present series of publications, entitled "Proceedings of the United States National Museum," the distinguishing peculiarity of which is that the articles are published in signatures as soon as matter sufficient to fill sixteen pages has been obtained and printed. The date of publication being plainly expressed in each signature, the ready settlement of questions of priority is assured.

The articles in this series consist: First, of papers prepared by the scientific corps of the National Museum; secondly, of papers by others, founded upon the collections in the National Museum; and, finally, of interesting facts and memoranda from the correspondence of the Smithsonian Institution.

The Bulletins of the National Museum, the publication of which was commenced in 1875, consist of elaborate papers (monographs of families of animals, &c.), while the present series contemplates the prompt publication of freshly acquired facts relating to biology, anthropology, and geology; descriptions of restricted groups of animals and plants; the settlement of particular questions relative to the synonymy of species, and the diaries of minor expeditions.

The Bulletins and Proceedings are published by the authority and at the expense of the Interior Department, and under the direction of the Smithsonian Institution.

The present volume, constituting the seventh of the series, has been prepared under the editorial supervision of Dr. Tarleton H. Bean, curator of the department of fishes.

SPENCER F. BAIRD,
Director of the U. S. National Museum.

UNITED STATES NATIONAL MUSEUM,
Washington, April 29, 1885.

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II.—New shells from Commander Islands and Point Barrow.

LIST OF CORRECTIONS.

Page 15, lines 1 and 2, for Guichénot read Guichenot.
Page 15, line 2, for Rév. read Rev.
Page 19, line 25, for *siullus* read *suillus*.
Page 100, line 9, for *Cryptotmus* read *Cryptotomus*.
Page 100, line 10, for *spinideus* read *spinidens*.
Page 100, line 27, for A. III, 9 (8) read A. II, 9 (8).
Page 125, line 31, for *Lone Snapper* read *Lane Snapper*.
Page 126, line 35, for *parræ* (Desmarest) read *acutum*, Poey.
Page 149, line 25, for *bistrispinosns* read *bistrispinosus*.
Page 149, line 33, for *psitttacus* read *psittacus*.
Page 155, line 26, for *Thynuus* read *Thynnus*.
Page 194, line 31, for C. & B. read C. & V.
Page 195, lines 33 and 44, for Cugupugnacu read Cugupuguacu.
Page 215, line 29 from below, for 6 adults read 7 adults.
Page 228, line 27, *Cepphus g.* should be moved up into the previous line in front of the word FLEM.
Page 237, line 19, for McKayi read MacKayi.
Page 239, line 13, for McKayi read MacKayi.
Page 254, line 7 from below, for *norwegcia* read *norwegica*.
Page 258, line 2, for *Salvelinas* read *Salvelinus*.
Page 263, line 31, for Antiquarum read Antiquorum.
Page 303, line 26, for POLY read POEY.
Page 310, lines 27, 32, 34, 35, for Jéniguano read Jeníguano.
Page 311, line 30, for Jéniguano read Jeníguano.
Page 317, line 13, for *parræ* (Desmarest) read *acutum*, Poey.
Page 327, line 15, for *Pordieps* read *Podiceps*.
Page 327, line 18, for fine read find.
Page 332, line 18, the name *Prionotus* cannot be used in Hemiptera.
Page 334, line 5 from below, for *Tropistenuas* read *Tropisternus*.
Page 341, line 3 from below, after LIMAX insert (AGRIOLIMAX).
Page 344, line 17, for *Capulacmæd* read *Capulacmæa*.
Page 344, line 21, for *Litorinna* read *Litorina*.
Page 344, line 29, for LACUNELLA (preoccupied) read LACUNARIA.
Page 344, line 34, for Lacunella refleza read Lacunaria reflexa.
Page 348, line 25 from below, for Lacunella reflexa read Lacunaria reflexa. (The same change should be made in the explanation of Plate II, ff. 1–3.)
Page 388, line 22, for *cirnioides* read *cernioides*.
Page 398, line 30, for Epinephelus read Enneacentrus.
Page 408, line 39 from below, for menzeli read mentzeli.
Page 432, line 34, the clause "Scales above lateral line in oblique series" belongs under "se" instead of "p".
Page 432, line 4 from below, for Mahogoni read Mahogani.
Page 476, line 15, for Altamaha read Allamaha.
Page 476, line 25, for *Lithrurus* read *Lythrurus*.
Page 476, line 44, for *lithrurus* read *lythrurus*.
Page 482, line 35, for Altamaha read Allamaha.
Page 537, line 20, for Tojeldia read Tofjeldia.
Page 545, line 1 for *Antheas* read *Anthias*.
Page 551, line 10 from below, for SAN CRISTOBAL read SAN CRISTOBAL BAY.

PROCEEDINGS

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UNITED STATES NATIONAL MUSEUM,

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Vol. VII, No. 1. Washington, D. C. June 3, 1884.

LIST OF, AND NOTES UPON, THE LICHENS COLLECTED BY DR. T. H. BEAN IN ALASKA AND THE ADJACENT REGION IN 1880.

By Dr. J. T. ROTHROCK.*

Many new species of lichens from a boreal region were hardly to be expected, inasmuch as the similarity of the northern flora is great in all longitudes. It is not surprising, however, that we do find in this collection quite a number of interesting forms, which illustrate the laws of variation inside specific limits in connection with geographical distribution. One new *Biatora*, however, from Eastern Siberia, rewarded Dr. Bean's active search.

For whatever accuracy in names this list may have I am indebted to my friend Mr. Henry Willey, who has kindly gone over the collection.

It will be observed that there are no notes given in this list (save of locality, &c.) until the genus *Bœomyces* is reached. This is because the recent publication of Professor Tuckerman's invaluable "North American Lichens" includes all the species before this genus, and hence renders anything more unnecessary.

Considering how inconspicuous the lichens usually are, and also how varied Dr. Bean's duties were, it is a matter of surprise that he has been able to obtain so satisfactory a collection.

LIST OF SPECIES.

Ramalina geniculata, Hook. and Tayl.

Ramalina calicaris, (L.) Fr., var. **farinacea**, Fr.

Little Koniushi Island, Shumagin group.

Ramalina polymorpha, Ach.

Saint Paul's Island, Behring Sea.

Usnea barbata, (L.) Fr.

Locality not given. Sterile.

*It is due to Mr. Willey to say that it was his desire to correct the proof. This, however, has been prevented by want of time in the printing. It is hoped that no errors of importance will be found.—J. T. R.

Usnea barbata, (L.) Fr., var. **dasypoga**, Fr.

Old Sitka.

Alectoria ochroleuca, (Ehrh.) Nyl., var. **sarmentosa**, Nyl.

Old Sitka. Sterile.

Alectoria ochroleuca, (Ehrh.) Nyl., var. **nigricans**, Nyl.

Chernofski, Unalashka. Sterile.

Alectoria jubata, (L.) Ach.

No locality given. Sterile.

Cetraria Fahlunensis, (L.) Schær.

No locality given.

Cetraria Islandica, (L.) Ach.

Plover Bay, Siberia.

Cetraria cucullata, (Bell.) Ach.

Chamisso Island, Arctic Ocean.

Cetraria nivalis, (L.) Ach.

Plover Bay, Eastern Siberia.

Cetraria lacunosa, Ach.

Sterile specimens from logs on island in Cross Sound, Baranoff Island, Sitka.

Cetraria glauca, (L.) Ach.

Luxuriant but sterile specimens from Cook's Inlet, Alaska.

Cetraria aleurites, (Ach.) Th. Fries.

Stein has said of this species that it is an evident transition, resembling *Cetraria* in its fruit and spermagonia, and *Parmelia* in its habit, and hence often placed by the later lichenologists in the latter genus. Cook's Inlet, Alaska; also, Eschscholtz Bay, on the bark of the Coniferæ.

Cetraria juniperina, (L.) Ach.

Small sterile specimens from Chamisso Island in Eschscholtz Bay; on bark.

Theloschistes parietinus, (L.) Norm.

Port Clarence, Alaska.

Theloschistes parietinus, (L.) Norm., var. **polycarpus**, Ehrh.

Widely diffused over the Arctic regions and apparently very common, being obtained at a number of points.

Parmelia saxatilis, (L.) Fr.

Cape Lisburne. Unalashka. On logs in Cross Sound, Alaska.

Parmelia saxatilis, (L.) Fr. var. **omphalodes**, Fr.

Near Cape Lisburne.

Parmelia physodes, (L.) Ach.

Elephant Point, Eschscholtz Bay, Arctic Ocean. Port Mulgrave, Yakutat Bay. Fort Alexander, in Cook's Inlet.

Physcia stellaris, (L.) Nyl.

Chamisso Island, in Eschscholtz Bay. Little Koniushi Island, of Shumagin group. Glacier Spit, in Cook's Inlet, Alaska.

Umbilicaria hyperborea, Hoffm.

Plover Bay, Siberia. Unalaska.

Umbilicaria proboscidea, (L.) Stenh.

Saint Matthew's Island.

Sticta pulmonaria, (L.) Ach.

Point Althorp, Alaska; fertile. Old Sitka; sterile.

Nephroma arcticum, (L.) Fr.

On Chamisso Island, in Eschscholtz Bay.

Peltigera apthosa, (L.) Hoffm.

Port Mulgrave, Yakutat Bay.

Peltigera canina, (L.) Hoffm.

Old Sitka. Port Mulgrave. Unalashka. Port Chatham, Cook's Inlet.

Pannaria hypnorum, (Hoffm.) Koerb.

Unalashka Island.

Pannaria brunnea, (Sw.) Mass.

On logs on island in Cross Sound, Alaska. Chernofski Island.

Collema pulposum, (Bernh.) Ach.

Cape Lisburne, Alaska.

Placodium elegans, (Link.) DC.

Chamisso Island. Elephant Point, in Eschscholtz Bay. Chernofski Bay.

Placodium murorum, (Hoffm.) DC.

Plover Bay, Eastern Siberia.

Placodium murorum, (Hoffm.) DC. var. **miniatum**, Tuckerman.

Placodium crenulatum, (Wahlenb.)

Plover Bay, Eastern Siberia. Sitka, on Baranoff Island.

Placodium vitellinum, (Ehrh.) Naeg. & Hepp.

Port Clarence, Alaska.

Placodium cerinum, (Hedw.) Naeg. & Hepp.

Icy Cape, Arctic Ocean.

Placodium ferrugineum, (Huds.) Hepp.

Port Clarence, Alaska, and elsewhere; not rare.

Placodium variabile. (Pers.) Nyl.

Port Clarence, Alaska.

Placodium nivale. Koerb.

Locality not given.

Lecanora muralis. (Schreb.) Schær.

Cliffs on Saint Matthew's Island, Saint Paul's Island, Sitka, Unalashka, and elsewhere: apparently very common.

Lecanora gelida. (L.) Ach.

Chernofski Island, Unalashka. Belkofsski, Aliaska Peninsula.

Lecanora pallescens. (L.) Schær.

Chugachick Bay, Cook's Inlet.

Lecanora tartarea. (L.) Ach.

Shumagin Group. Unalashka Island. Cape Lisburne, Arctic Ocean.

Lecanora atra. (Huds.) Ach.

Cape Lisburne, Alaska.

Lecanora subfusca. (L.) Ach.

Cook's Inlet. Unalashka. Port Clarence.

Lecanora subfusca. (L.) Ach. var. hypnorum, Schær.

Port Clarence. Cape Lisburne.

Lecanora Hageni. Ach.

Cape Lisburne, Alaska.

Lecanora varia. (Ehrh.) Nyl.

Plover Bay, Eastern Siberia.

Lecanora cinerea. (L.) Sommerf.

Port Clarence, Icy Cape, and Cape Lisburne, in Alaska.

Lecanora cinerea. (L.) Sommerf. var. gibbosa, Nyl.

Lecanora cinerea. (L.) Sommerf. var. lacustris, (With.) Nyl.

Plover Bay, Eastern Siberia.

Lecanora verrucosa. (Ach.) Laur.

Eschscholtz Bay, Arctic Ocean.

Lecanora glaucomela. Tuckerm.

Lecanora cervina. (Pers.) Nyl.

Eschscholtz Bay.

Lecanora cervina. (Pers.) Nyl. var. disecreta, Sommerf.

Port Clarence, Alaska.

Rinodina nimbosa. (Fr.) Th. Fr.

Cape Lisburne, Arctic Ocean.

Rinodina sophodes, (Ach.) Nyl.

Cape Lisburne.

Rinodina sophodes, (Ach.) Nyl. var. **confragosa**. Nyl.

Rinodina turfacea, (Wahl.) Nyl.

Pertusaria communis, DC.

Port Clarence, Cape Lisburne, and Port Althorp, Alaska.

Pertusaria bryontha, (Ach.) Nyl.

Unalashka Island.

Pertusaria dactylina, (Ach.) Nyl.

Plover Bay, Eastern Siberia, and Aliaska Peninsula, Alaska.

Pertusaria velata, (Turn.) Nyl.

Warm Springs, Sitka.

Pertusaria glomerata, (Ach.) Schær.

Port Mulgrave.

Urceolaria scruposa, (L.) Ach.

Stereocaulon paschale, (L.) Fr.

Common and everywhere met.

Pilophorus acicularis, (Ach.) Tuck.

Saw-Mill Creek, Sitka.

Cladonia pyxidata, (L.) Fr.

Chamisso Island. Eschscholtz Bay, at Elephant Point. Aliaska Peninsula.

Cladonia pyxidata, (L.) Fr. var. **symphycarpa**, Fr.*

Cook's Inlet at Fort Alexander.

Cladonia vermicularis, Ach.

[Thamnolia vermicularis, Sw.] Schær. in Tuckerman's North American Lichens, part 1, p. 256.?]

Cladonia cenotea, (Ach.) Schær.

Island in Cross Sound, Alaska; and from Cook's Inlet and Sitka forms, which Mr. Willey doubtfully refers here.

Cladonia squamosa, Hoffm.

Sitka, at Warm Springs.

Cladonia rangiferina, (L.) Hoffm.

Common, though collected sparingly and at few points.

Cladonia cornucopioides, (L.) Fr.

Eastern Siberia, at Plover Bay. Port Althorp, Alaska.

Cladonia bellidiflora, (Ach.) Schær.

Eastern Siberia, at Plover Bay.

* See Tuckerman's American Lichens, p. 239.

Cladonia digitata, (L.) Hoffm.

Old Sitka.

Bæomyces aeruginosus, (Scop.) Nyl.

Sitka and Port Althorp, Alaska.

Spores narrowly oblong acute at either extremity, colorless, uniseptate, 19 × 5 mic.

Biatora sanguineo-atra, Fr.

Old Sitka, on logs.

Spores oblong, simple, colorless, 10 × 5 mic.

Biatora milliaria, Fr.

Shumagin Group of Islands.

Spores 16–22 × 5–6 mic.

Biatora Sibiriensis, Willey, sp. nov.

Port Providence, Plover Bay, East Siberia.

Thallus effuse, whitish or pale flesh-colored, granulose; apothecia pale flesh-colored, soon convex and immarginate; hypothecium pale; paraphyses conglutinate. Reaction of hymenium with iodine blue; spores acicular, few locular, 22–27 mic. long, 3–4 mic. broad.

Heterothecium sanguinarium, (Fl.) Tuck.

Eschscholtz Bay; Yakutat Bay; Cook's Inlet.

Heterothecium sanguinarium, (Fl.) Tuck. var. **alpinum**, Fr.

Shumagin Group of Islands.

Lecidea albo-cœrulescens, Fr.

"Hypothecium nigrescent, sporæ magnæ." (H. Willey.)

(By my measurements the simple spores are 11–16 × 8–11 mic. J. T. R.)

Lecidea albo-cœrulescens, Fr. var. **flavocœrulescens**, Tuckerm. In ed.

Aliaska Peninsula.

Spores colorless, simple 8–16 mic. long by 5–11 wide.

(Peculiar for the brown color of the apothecium arising from oxidation.—Willey.)

Lecidea contigua, Fr.

Plover Bay, Eastern Siberia. Unalashka. Aliaska Peninsula. Chamisso Island, Eschscholtz Bay.

A specimen from Unalashka with hypothecium black and spores 13–19 mic. long × 6–7 mic. wide. Willey.

Aliaska Peninsula.

Lecidea contigua, Fr. var. **speirea** (Ach.) Nyl.

Lecidea enteroleuca, Fr.

Chamisso Island in Eschscholtz Bay. Port Clarence. Cape Lisburne. Old Sitka.

Spores simple, colorless, 13–22 mic. long × 5–7 mic. wide.

Lecidea enteroleuca, Fr. var. **latypea** (Ach.) Nyl.

Lecidea spilota, Fr.

Cape Lisburne, Arctic Ocean.

Spores simple, ellipsoid or oblong 9–11 mic. long × 4–6 wide.

Lecidea fuscoatra, Fr.

Lecidea panæola (Ach.) Fr.

Chernofski Bay, Unalashka Island.

Spores large, in one instance as much as 27 mic. long by 22 broad, simple, colorless, or slightly tinged with dark, somewhat smoky-hued. In Mr. Willey's notes I find he gives spores 23–30 mic. long × 11–16 wide. The epispore is very large and distinct.

Buellia atro-alba (Fr.).

St. Paul's Island. Unalashka Island. Plover Bay, Siberia.

Spores 16–23 mic. long × 11–13 wide, blackish-brown, (among them were a number of well-formed and colored spores apparently of this species only 12×7 mic.).

Buellia atro-alba, Fr. var. **chlorospora**, Nyl.

Chamisso Island in Arctic Ocean.

Spores uniseptate, colorless, 18–23 mic. long × 11–13 wide.

Buellia parasema (Ach.) Kbr.

Port Clarence, Alaska. Plover Bay, Siberia.

Spores 16–19 mic. × 5–8, brown, uniseptate, 2-nucleated.

Buellia myriocarpa (DC.), Mudd.

Port Clarence, Alaska.

Spores 9–16 mic. long × 4–8 wide, oblong, brownish, uniseptate and with a distinct epispore.

Buellia albo-atra (Hoffm., Nyl.) Th. Fr.

Unalashka.

Tuckerman (Gen. Lich., p. 188) writes of this species that it "mediates satisfactorily between the bi-quadrilocular *B. parasema* and *papillata*, and the distinctly uniform-multilocular *B. oidalea*."——*B. albo-atra*, "the regularly quadrilocular spores of which soon exhibit plain indications of the next or muriform modification, is not uncommon." Spores brown, usually 4-celled, sometimes 3-, or even 2-celled, oval to oblong, 11–19 mic. long × 8 mic. wide.

Buellia alpicola (Nyl.) Anz.

Head of Plover Bay, East Siberia.

The solitary satisfactory spore I have been able to obtain was 25 mic. long × 10 mic. wide, brown and uniseptate. I had supposed it

was the same as *Lecidea alpicola*, Schær., but that, Leighton (Lichen Flora of Great Britain, p. 328) states, has colorless spores.

Buellia petræa, (Fl.) Tuck.

Saint Paul's, Kodiak. Port Clarence, Alaska. Plover Bay, Siberia.

Apparently very variable. Th. with potassium hydrate and lime brown, with lime light yellow. Spores elliptical or oblong murali-locular (apparently); in my specimens only 1 or 2 in an ascus 50–55 mic. long, by 35 broad; epispore thick, interior light greenish brown.

Buellia petræa, (Fl.) Tuck. var. **Montagnei**, (Fl.) Tuck.

Cook's Inlet and Port Clarence, Alaska.

Spore oblong-elliptical, murali-locular, 50 to 60 mic. long, by 15 to 30 broad, epispore usually very thick (5 mic.); somewhat distinctly constricted or transversely marked; interior greenish yellow.

Buellia petræa, (Fl.) Tuck. var. **Oederi**, (Ach.) Kbr.

Locality not given.

Buellia geographica, (L.) Br. & Rostr.

Aliaska Peninsula.

A widely diffused and variable species; spores dark-brown, irregularly 2-celled or murali-locular, 22–35 mic. long, by 13–16 mic. wide.

Xylographa opegraphella, Nyl.

Cook's Inlet, Alaska.

Spores simple, colorless, oblong, obtuse or acutish, straight or very slightly curved, often somewhat clearly nucleated at each end. My own measurements give for the spores 11–12 mic. long by 2–4 mic. wide. Mr. Willey finds them varying from 9–15 mic. long by 4–6 mic. wide.

Xylographa parallela, (Ach.) Fr. var. **pallens**, Nyl.

Island in Cross Sound, Alaska.

Spores simple, elliptical, colorless, 10–15 mic. long by 5–8 wide.

Sphærophorus globiferus, (L.) DC.

Saint Matthew's Island in Behring Sea; also at Port Mulgrave and Little Koniushi Island of the Shumagin Group.

Spores globular, simple, with a dark violet epispore* 8–11 mic.; when without epispore colorless or greenish, 5–8 mic. in diameter.

* "Leighton describes the spores as hyaline and double-walled, and ascribes their black color and irregular granulated form to their contents, which are blackish or bluish black granules, and which when they escape adhere to the exterior of the mother-cell. Tulasne speaks of the epispore as black and tuberculated, while the endospore is pale but thick; and the phenomena of germination prove the correctness of this view."—Popular History of British Lichens, by W. Lauder Lindsay, M. D., p. 288. See also Leighton, Lichen Flora of Great Britain, 3d edition, p. 48. I have accepted here the view of Tulasne as that which my observation more fully confirms, but at the same time, find a large quantity of the same material as that of which the so-called epispore is composed, and which appears to have no relation to epispore.—J. T. R.

Endocarpon cinereum, Pers.

Saint Paul's Island, Behring Sea.

Verrucaria maura, (Wahl.) Nyl.

Fort Alexander, Cook's Inlet.

Spores simple, colorless, oblong, 12–15 mic. long by 6–8 broad.

Verrucaria ceuthocarpa, Wahl.

Fort Alexander, with the above species. Sterile.

Verrucaria intercedens, Nyl.

Cape Lisburne, Alaska.

"Paraphyses dissolving: gelatina hymenea vinous red with iodine. Spores 8, muriform, plurilocular, colorless, 23–32 mic. long by 11–12 wide."—WILLEY.

Verrucaria intermedia, (Th. Fr.)

"Paraphyses dissolving: gelatina hymenea vinous red with iodine. Spores 8, muriform, few-celled, 18–23 by 11–13 mic."—WILLEY.

ON THE CHLOROPHYLLOID GRANULES OF VORTICELLA.

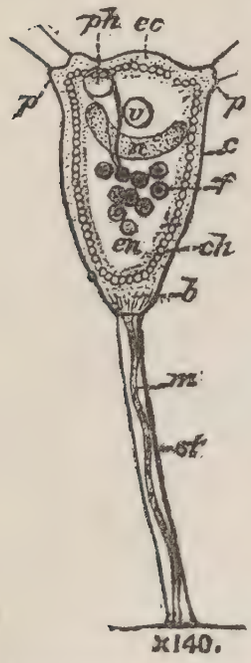
By JOHN A. RYDER.

In *Science*, No. 45, note 487, p. 772, the researches of Th. W. Engelmann, of Utrecht, are noticed and criticised. Having had occasion several years since to study one of our American forms of green *Vorticellæ*, which at the time was identified as *V. chlorostigma*, I would now take the opportunity to record what was then observed, inasmuch as the facts as interpreted by me seem to lead to conclusions differing very considerably from those reported by Professor Engelmann. Observations which I have made within the present year on the relations of the *Schizomycetes* to living and dead Protozoa, have also led me to conclusions at variance with that author's interpretations.

In order to understand the points in dispute, it will be necessary to describe the morphology of the form studied by the writer, as well as the position and relations of the included chlorophylloid granules, all of which may be more clearly comprehended by reference to the accompanying figure which shows the form in question enlarged 140 times, and taken from drawings made several years since from the living subjects.

The form was similar to other *Vorticellæ* in everything except the presence and orderly arrangement of the green granules. There was a hollow stalk, *st*, which ensheathed a muscle, *m*, which in turn was inserted into the very faintly striated base *b* of the body of the animalcule. There was, as usual, an outer cuticular layer, *c*, covering the body and continuous with the stalk *st*. Within the cuticle the ectosarc or ectoplasm *ec* formed the outer or cortical portion of the body of the ani-

malcule, and in this the chlorophylloid granules were embedded with the most remarkable regularity, forming, indeed, a one-layered investment; the individual grains often being pressed into a distinctly prismatic form where they were much crowded together. Only now and then was it observed that there were spaces or areas of the ectoplasm in which none of these green granules were present. No chlorophylloid matter whatever was found in the endoplasm *en* after the most careful search for the same, and this indeed was also found to be the case with the free swarmers of the same species, which had the form of cylinders, truncated at both ends, but somewhat wider at the peristomal end and about three times as long as they were thick. An abundance of material kindly furnished me by Mr. W. P. Seal, and which that gentleman obtained near Woodbury, N. J., enabled the writer to study the form in question very thoroughly, and there remains no shadow of doubt as to the fact of the arrangement of the green granules as here described.



Vorticella chlorostigma, seen in optic section so as to display the stratum of chlorophylloid granules, *ch*, embedded in the ectoplasm, *ec*, and entirely inclosing the endoplasm, *en*.

The funnel-shaped pharynx *ph* led down into the endoplasm *en* in the usual way from the margin of the ciliated peristome *p. p.* At its lower end food-vacuole after food-vacuole was formed by the slow dilatation of this part into a bulbous enlargement by the force exerted by the band of pharyngeal cilia, and after the enlargement of the globular space at the lower end of the pharynx had proceeded up to a certain point, its connection with the pharynx would be suddenly broken and the food-vacuole would be thrust into the adjacent endoplasm by the bulbous enlargement of the lower end of the pharynx, where a second food-vacuole was forming, and which would press against the one previously formed and force it deeper into the surrounding plasma. It is this constant formation of food-vacuoles which is the cause, in part, of the movements of the food-vacuoles themselves. A large pinkish contractile vesicle or vacuole, *v*, was present near the upper part of the body of the bell close to the wall of the pharynx. Just below the contractile vesicle the nucleus or endoplast *n* was placed, and had the sausage-shape so often noticed in this type of protozoa. Below and on either side of the endoplast the food-vacuoles *f* were abundant. (Only a few have been represented below the endoplast in order not to sacrifice clearness of outline.)

The existence of the green coloring matter in the ectoplasm of Infusorians has already been noticed by Stein in *Stentor*, and my only reason for writing this notice is to call attention to the fact that in *V. chlorostigma*, at least, the green matter is not "diffuse" as stated by Engelmann in regard to the species studied by him, but is restricted with great regularity to individual granules as in plants, and that these

grains form an exceedingly well-defined one-layered stratum which is restricted to the ectoplasm alone.

"Entz has discovered that he could cause colorless Infusoria to become green by feeding them with green palmellaceous cells, which, moreover, did not die after the death of their hosts, but continued to live, growing and developing within the latter until their total evolution proved them to be forms of very simple microscopic green algæ, such as *Palmella*, *Glœocystis*, &c. (E. P. Wright.) * * * There may be parasites such as observed by Dr. Entz, but, judging from their superficial position [in *V. chlorostigma*], their globular form, and behavior towards reagents, the absence of a nucleus, or of any cleavage stages, they must, it seems to me, be regarded as integral parts of the creatures in which they are found."

The above the writer quotes from a paper published by him two years since in Forest and Stream, and later in Bull. U. S. Fish Comm., I, 411, and in the interim no facts have been brought to his notice which have tended to shake his faith in the soundness of this view.

It is true that there are certain Infusorians in which a bottle-green tint is diffuse and not confined to distinct grains, as, for instance, in *Stentor Müilleri* and *Freia producta*, both of which the writer has studied, but in *Stentor polymorphus* and the green species of *Ophrydium* the color is confined to distinct granules, as in the species of *Vorticella* which I have figured. The uncolored species of *Ophrydium*, found in Frankford Creek, and which has been named *O. adæ* by Everts, does not differ much in other respects from its congeners, but the colorless *Stentor Rœseli* does differ considerably in form and details of habit from its allies. These are facts which, it seems to me, are almost fatal to the theory of the existence of green parasitic vegetable forms in Infusorians, the only facts favorable to the idea that the green color is due to algous parasites being those noted of *Ophrydium*, a genus which affords an instance of green and colorless forms, differing otherwise but slightly. In fact, individual zoöids of *Ophrydium* are sometimes met with which are only partly green, or have only one-half the body colored, while alongside of them in the same colony individuals are found which are wholly green. Then, again, how are the so-called red and dark-colored Stentors to be disposed of, both of which have been detected in the United States? For these, indeed, it may be claimed that degenerating chlorophyll would be capable of producing the red color of the first, and that feeding on very dark colored algæ might develop the latter. In spite of all this, however, there remains a residuum of facts which cannot be disposed of on any theory of symbiosis or parasitism, and this is especially the case with these forms which, as in *Stentor*, show three distinct types of coloration, viz, the diffuse bottle-green, that caused by colored green granules, and the colorless; all of these differences at the same time being indicative, together with other features, of very distinct species.

Finally, as to the aggregation and development of *Bacteria* about living Infusorians, this I have noticed in a colorless marine species, viz, *Zoöthamnium alternans*, and the same fact has been observed by Stein. Both Stein and myself have noticed *Bacilli* mostly in this relation to other living colorless Infusorians, but in the case of dead and colorless Infusorians the remains of the animals are usually attacked at one side and gradually invaded by *Bacilli* and *Micrococci*, and altogether independently of any peculiarly local oxygen-yielding source in the vicinity.

In conclusion it may be said that if there exist green *Vorticella* which have the green coloring matter arranged diffusely in the ectoplasm in one species, and in another confined to distinct granules as observed in the species here described, it is fair to presume that, as in the cases of the three species of *Stentor* alluded to above, that we also have to do here with two very distinct species of Bell-animalcules. It is also fair to assume that if the different species present their coloring matters in diverse conditions and modes of arrangement that such matters may have correspondingly different functions, and that it does not necessarily follow that the green granules even are a sure indication of the presence of true chlorophyll, though it may simulate that of the plant in its relation to the stratum of plasma covering the cell-wall. Why not suppose that some of these coloring matters of Infusorians have a function similar to hæmoglobin? It would, however, be much easier to suppose that the quasi-chlorophyll grains of *V. chlorostigma* were truly of the nature of chlorophyll than to assume as much regarding the diffuse green color as observed in the ectoplasm of a supposed variety or closely affiliated species of *V. campanula*, as has been done by Engelmann.

WASHINGTON, *December* 20, 1883.

A NEW GEOGRAPHICAL RACE OF THE MOUNTAIN SHEEP (OVIS MONTANA DALLI var. nov.) FROM ALASKA.

By E. W. NELSON.

During the course of my residence at Saint Michael's, Alaska, and subsequent travel along the Arctic coast of this Territory, between July, 1877, and September, 1881, hundreds of skins were seen of the Mountain Sheep, which I here designate as a new geographical race.

The types of the new race are two specimens brought me by Mr. L. N. McQuesten, a fur-trader living at Fort Reliance, on the Upper Yukon River, near the point where it crosses the British boundary line. These specimens were killed by the Indians on some mountains south of Fort Yukon, and on the west bank of the river.

From Mr. McQuesten, and various other fur traders along the Yukon and elsewhere, and my own observations, I learned that the range of

this form covers nearly all the mainland of Alaska where there are mountains, excepting the vicinity of the Bering sea coast. It is limited strictly to the mainland and occurs only among the higher parts of the mountains south of about 68° of latitude, but north of this it is found on lower ground, and as the mountains give place to low hills and rolling plains near the Arctic coast, it descends nearly or quite to the sea-level.

The southern limit is at present unknown, but is probably in about latitude 55° and north nearly to 70°.

The Mountain Sheep found along the Lower Mackenzie River close to the Arctic coast, by Richardson, undoubtedly belong to this race, as do others found in the northern part of British America.

Among the natives I have seen typical skins from the mountains south of the Upper Kuskoquim River; from the headwaters of the Tanana; from the Kaviak Peninsula near Bering Straits; also from the mountains east and northeast of Kotzebue Sound, and, during the summer of 1881, while cruising between Kotzebue Sound and Point Barrow we saw hundreds of skins among the Eskimos, who invariably pointed to the low range of mountains a few miles back from the coast, when asked where the sheep were found.

While hunting near Cape Thompson, on the Arctic coast, the middle of July, 1881, I saw a pair of these animals within about five miles of the coast at an elevation of not over 300 feet above the sea. They were feeding on an open grassy plain at the foot of a series of low hills over which they ran the moment they caught wind of me, as I tried to approach along the bed of a small gully. Among the skins seen by me I have been particularly struck by the uniformity in general coloration and appearance. In the present preliminary account only the most superficial peculiarities can be noticed owing to the writer's absence from Washington; but in a general list of Alaskan Mammals in preparation I hope to give fuller details.

DESCRIPTION.

OVIS MONTANA DALLI var. nov. Northern Mountain Sheep.

This form can be recognized at once by its nearly uniform dirty-white color, the light-colored rump area seen in typical *montana* being entirely uniform with the rest of the body in *dalli*. The dinginess of the white over the entire body and limbs appears to be almost entirely due to the ends of the hairs being commonly tipped with a dull rusty speck. On close examination this tipping of the hairs makes the fur look as though it had been slightly singed. This form also has smaller horns than its southern relatives, but how the two compare in general size and weight I am uable to say.

I name this form in honor of Mr. W. H. Dall, whose scientific work in Alaska is so well known.

HAMILTON, NEW MEXICO, *December* 22, 1883.

NOTE ON SELASPHORUS TORRIDUS SALVIN.

By ROBERT RIDGWAY.

By an error of identification this species is given as *S. flammula* in Mr. Nutting's catalogue of birds obtained on the Volcan de Irazú, Costa Rica (cf. these "Proceedings," vol. 5, p. 497). The National Museum has obtained additional specimens of *S. torridus* from Costa Rica, through Dr. Van Patten, and also of *S. ardens*, both species being additions to the fauna of that country.

S. flammula is as yet unrepresented in the National Museum collection.

JANUARY 7, 1884.

A REVIEW OF THE SPECIES OF THE GENUS CALAMUS.

By DAVID S. JORDAN and CHARLES H. GILBERT.

In a recent visit to Key West and Havana Professor Jordan has collected a large number of specimens of the genus *Calamus*, representing five species. In attempting to identify these we have had many difficulties, owing to the scanty and miserable character of most of the literature pertaining to the subject. We have here redescribed the five species mentioned above, and have attempted to collate the synonymy of these as well as that of the remaining species.* Those features common to all known species of *Calamus* are not repeated in the descriptions. A series of specimens representing each of these species is in the United States National Museum.

The following is an analysis of the five species obtained at Key West:

a. Scales comparatively small, about 55 in the course of the lateral line.

b. Upper jaw with two strong canines directed forwards; body deep, the depth about half the length; preorbital with horizontal wavy blue lines. PENNATULA, 1.

bb. Upper jaw without antrorse canines.

c. Anterior canines scarcely enlarged, about two to four in number in each jaw; body deep, the depth about half the length; cheeks bluish, with roundish bronze spots ..... CALAMUS, 2.

cc. Anterior canines strong, about 6 in number in each jaw; body rather oblong, the depth $2\frac{2}{3}$ in length; cheeks plain ..... BAJONADO, 3.

aa. Scales comparatively large, about 46 in the lateral line; anterior teeth rather small, uniform.

d. Dorsal outline forming a comparatively regular arch, the back elevated; depth about 2 in length; ventrals dusky; a small, ink-like spot above base of pectoral ..... MILNERI, 6.

dd. Dorsal outline not forming a regular arch, the profile of the head being very convex, the back straightish; body rather elongate, the depth less than half length; preorbital usually bluish, with bronze spots and dashes; no black spot at base of pectoral above; ventrals pale ..... ARCTIFRONS, 9.

* *Chrysophrys taurinus* Jenyns (=*Pagellus cyanopterus* Val.), from the Galapagos Islands, is omitted, as we are not sure that it belongs to this genus.

1. Calamus pennatula Guichénot.—*Little-head Porgy; Pez de Pluma.*

Calamus pennatula Guichénot, Rév. Pagels, 116. (Martinique.) Poey, Monogr. Sparini 1872, 178 (in part).

Calamus megacephalus Jordan & Gilbert, Syn. Fish. N. A., 1883, 926. (Florida Keys.) (Not of Swainson.)

Head, $3\frac{1}{4}$ to $3\frac{1}{2}$ in length ($4\frac{1}{4}$ in total); depth, 2 to $2\frac{1}{3}$ ($2\frac{2}{3}$ to 3); D. XII, 12; A. III, 10. Scales 9–58–16.

Body much elevated, more so than in any other known species except in *calamus*. In adults the anterior profile rises in a straight line very steeply to the nape, thence in a gentle curve to front of dorsal. In the young the profile rises less rapidly and is convex. Greatest depth of preorbital slightly more than half length of head in adults.

Mouth not large, the maxillary scarcely reaching vertical from front of orbit, two-fifths length of head. Anterior teeth of outer series slightly longer and more robust than those of the cardiform band. In the upper jaw on each side one of these outer teeth becomes much enlarged, canine-like, directed obliquely forwards and downwards, and strongly curved, the upper surface concave; there are usually seven teeth of the outer series between these two canines. No evident accessory series of molars. Eye moderate, 4 in head in adults (11 inches long), 3 in head in young of 6 inches.

Dorsal spines slender and high, the longest half head. Pectorals reaching vertical from origin of anal fin, one-third length of body. Ventrals 5 in length. Upper lobe of caudal as long as head, slightly longer than lower lobe.

Color in life.—Silvery, with bright reflections above, much more brightly colored than in other species. Each scale above middle of sides with a spot of rich violet-blue on its basal portion, these forming distinct longitudinal streaks along the rows of scales. On lower part of body these blue spots are replaced by pale orange spots, faint in the young, very distinct in adults. In life the sides have dark bands, which disappear after death.

A diffuse, ill-defined horizontal violet-blue area above opercle extending back onto the shoulder. A well-defined horizontal deep-blue stripe below eye; another, somewhat less distinct, above orbit. Preorbital region, snout, cheeks, and opercles brassy or bronze, crossed with horizontal, wavy, non-reticulating lines of violet-blue, these colors more marked on preorbital and snout; the streak crossing snout above nostrils wider and rather more conspicuous than the others.

Dorsal marked with orange and very bright violet, its margin always orange, more or less bright in life. Caudal banded with dull orange. Anal distinctly blue shaded. Ventrals not dark, with more or less light yellow. Axil slightly dusky.

Iris dark, with gilt ring.

A single young specimen from Key West, 5 inches long, has all the teeth of the anterior row in the upper jaw uniformly small and vertical.

In all other characteristics it agrees with older examples of the present species, and we refer it here with little doubt. The colors are as described above, and the eye is small, $3\frac{1}{2}$ in head. It is probable that the antrorse canine of the upper jaw is not developed in very young specimens. We find it perfect, though small, in one of 8 inches. In adults it becomes very large and conspicuous.

This species is very abundant in the channels among the Keys about Key West, and is taken in great numbers by the hook and line fishermen. It is known to them as the *Little-head Porgy*. In life it is a very brightly colored fish, but at death its colors change and fade very rapidly. This change of hue is in this species as striking as in any known to us, and far greater than that of the dying dolphin.

This species is also constantly found in the Havana market, where it is known as *Pez de Pluma*. Neither at Havana nor at Key West is it as common as *Calamus bajonado*, but in both markets it exceeds in abundance all the remaining species combined.

SYNONYMY.—Guichénot's description of *Calamus pennatula* must have been based upon a specimen of this species as he mentions the characteristic canines directed forwards in the upper jaw, and the horizontal blue stripes on the preorbital. The depth assigned by him (3 in total length) is too small, but this is probably a slip of the pen, inasmuch as he states that the height is greater in *pennatula* than in any other species of the genus except *calamus*.

Calamus megacephalus Poey, *l. c.*, includes characteristics of both *calamus* and *pennatula*. The characters drawn from the dentition are entirely those of *pennatula*, while the color and general description undoubtedly refer to *calamus;* the life-color being given in detail and very accurately.

2. Calamus calamus (Cuv. and Val.) Jor. and Gilb.—*Saucer-eye Porgy.*

Pagellus calamus Cuvier and Valenciennes, Hist. Nat. Poiss. VI, 1830, 206, pl. 152. (Martinique: San Domingo.)

Chrysophrys calamus Günther, Cat. Fish. Brit. Mus. I, 487. (Bahia; Trinidad; Cuba; Jamaica; two or more species evidently confounded.)

Calamus megacephalus Swainson, Nat. Hist. Fish., &c., II, 1839, 222 (name only, after Cuv. and Val.): Guichénot, Révision du Genre des Pagels in Mém. Soc. Imp. Nat. Cherbourg, XIV, 112 (description from C. and V. with a few verbal changes).

? *Pagellus orbitarius* Poey, Memorias Cuba, II, 1860, 201. (Havana.)

? *Sparus orbitarius* Poey, Syn. Pisc. Cubens. 1868, 308. (Havana.)

? *Calamus orbitarius* Poey, Ann. Lyc. Nat. Hist. N. Y., 1872, 179, Pl. VI, f. 2 (Havana): Guichénot, Rév. du Genre des Pagels, 123 (name only).

? *Calamus macrops* Jordan and Gilbert, Syn. Fish. N. A., 1883, 927. (Young, Garden Key, Florida.)

Head, $3\frac{1}{3}$; depth, $1\frac{9}{10}$ to $2\frac{1}{4}$ ($2\frac{3}{4}$ in total). D. XII, 12 (XIII, 11); A. III, 10, or III, 11. Scales 9–54–16.

Body elevated more than in any other known species of this genus, the depth in adults being slightly more than half length of body. The anterior profile is less steep than in *pennatula*, the outline of snout

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being slightly curved; in adults the antedorsal region is very sharply compressed and somewhat gibbous, forming above eye an angle with rest of profile. Greatest depth of preorbital more than half head in adults.

Mouth small, the maxillary scarcely reaching vertical from front of eye, $2\frac{2}{3}$ in head.

Anterior teeth of outer series in both jaws enlarged and strong, well differentiated from the cardiform band within. In both jaws one or two pairs of these teeth are usually larger than the others, perhaps meriting the name of canines; they are occasionally wanting. The normal number of these enlarged teeth seems to be 10 in the upper jaw and 8 in the lower. A small accessory band of molars behind the cardiform band above and below.

Eye large, $3\frac{3}{4}$ in head in adults (12 inches long).

Dorsal spines stronger and lower than in *pennatula*, the longest $2\frac{1}{3}$ in head. Pectorals reaching slightly beyond vertical from front of anal, rather more than $\frac{1}{3}$ length of body. Ventrals $4\frac{1}{2}$ in length. Anal spines robust.

Color in life.—Silvery with bluish reflections; the base and central portions of each scale golden, forming distinct longitudinal stripes, the stripes between these pearly or bluish; rows of scales on cheeks and opercles with the pearly stripe median, the golden marginal. A deep violet streak below orbit, not extending forward on snout nor backward on opercles. Preorbital deep dull violet like the snout, the ground color forming reticulations around conspicuous round brassy spots which cover half the surface. Naked part of preopercle sometimes similarly marked, more often colored like the body. Edge of opercle gilt. Lower jaw dusky violet. Axil golden; base of pectoral above with a violet bar. Fins all pale, vaguely blotched with dull orange. Ventrals more or less dusky on inner rays. Commissure of lips yellow. Iris golden.

This species is common at Key West, where it is taken in considerable numbers with the hook and line in the channels. It reaches a length of about 15 inches, and is known to the fishermen as the Saucer-eye Porgy. It is less abundant than *C. pennatula*, and much less brightly colored in life.

But a single specimen was seen by Professor Jordan in the Havana market, it being far less abundant there, in the winter at least, than *C. bajonado* or *C. pennatula*. It is confounded by the Cuban fishermen with the latter as *Pez de Pluma*.

The description and figure given by Cuv. & Val. of *Pagellus calamus* agrees with this species in all respects except the color, which was taken from an old specimen in alcohol. Thus the "bluish points on the sub-

orbital" appearing on a darker background were in life the light bronze spots surrounded by the network of dark blue.

The name *megacephalus* was given to the species by Swainson as a substitute only for *calamus* C. & V., in accordance with the common but very objectionable practice of altering the specific name when it resembles or is identical with the generic one.

Guichénot's description of the species is based upon that of Cuv. & Val., with some few corrections and additions.

The descriptions of Professor Poey of his *C. orbitarius* seem to have been chiefly based on this species, but there is evidence of a confusion in his notes, some of his remarks applying rather to *C. pennatula*, which species is the common *Pez de Pluma* of the Havana markets. Thus his description of the canines (those of the upper jaw small, except the second, which projects; those of the mandible scarcely larger than the cardiform teeth) and the color of the preorbital (blue streaks, forming a network) indicate *calamus*, while the diffuse blue streak across opercular region behind eye is found in *pennatula* but not in *calamus*.

NOTE.—It has been a frequent custom in zoölogy, dating from the immediate followers of Linnæus, to take for a generic name the original specific name of the typical species, and then, to prevent the tautological use of the same word for both genus and species, to change the specific name, thus establishing a "new species," as well as a new genus. In such cases at least six different modes of procedure have been advocated and more or less consistently followed by different writers. These are the following:

1. To change the generic name so derived from a specific one. This arrangement was once recommended by the British association, but after a time it seems to have been abandoned by common consent. In ichthyology it would necessitate the change of many of the generic names best known, as, for example, a large share of those of Cuvier in the Regne Animal. Again, and still more important, this rule is in itself a direct violation of the law of priority, as important in regard to genera as in regard to species.

2. To adopt the generic name, and to change the specific name to *vulgaris* without regard to previous synonyms. This rule was largely followed by Cuvier and Valenciennes, but the fact that it has not been generally followed is sufficient argument against its use.

3. To use the name *typicus* in the above case, without regard to previous synonyms. This has had no general acceptance.

4. To use in the above cases a genitive formed from the name of the describer of the original species as a specific name. This has been consistently followed by Professor Malm, who has changed the name of the typical species of many genera (*Trachurus, Molva, Lota*, etc.) to "*Linnæi*," without regard to other names or synonyms.

5. To choose as a new specific name when the former specific name is used as generic, the specific name next oldest in the synonymy. This rule is the one generally followed by authors who have endeavored to be consistent in their nomenclature, and it is the one adopted by nearly all recent authors in America. If the original specific name is regarded as having become ineligible, this seems the proper course to follow. One important disadvantage is that in nearly every case it necessitates the revival of some forgotten and often doubtful and, in itself, worthless synonym. For this reason, probably half the species so named have their proper nomenclature still unsettled. In case, also, the genus in question is of doubtful validity, the confusion made by this procedure is considerable. Thus if, with most European writers, we adopt the genus

Pagrus, we should say *Pagrus argenteus* using the half-forgotten synonym *argenteus*; but if, with the present authors, *Pagrus* be regarded as a subgenus only, its typical species should be *Sparus pagrus*.

6. In case of the adoption of a specific name as generic, to choose as the new specific name whatever name the author of the genus may have himself chosen to call the species, without reference to previous synonyms. This rule seems to have been followed with more or less consistency by Dr. Günther in his Catalogue of the Fishes of the British Museum. This rule has the advantage of definiteness, nor does it contain any injustice to earlier writers, for the earlier synonyms have no claims *per se*, being antedated by the specific name selected as generic. But no one has applied this rule in detail, and it seems not likely to receive general adoption.

7. To retain the earliest generic and earliest specific names, without regard to their similarity. This is the dictate of the law of priority, which is steadily becoming more and more urgent. The best system of rules is that which permits of fewest exceptions, and certainly exceptions to the application of this most important rule of priority should be very few indeed. It seems to us that no advantage worthy of consideration comes from the change of either specific or generic name when the two are alike, while the disadvantages are many and serious. There is, in fact, a certain degree of appropriateness in thus repeating the generic name for its typical species. Nor is this idea foreign to the Latinic languages, however uncommon it may be in classical Latin. The Cuban fishermen call all the species of *Hæmulon* "*Ronco*"; those of *Harpe* and *Lachnolæmus*, "*Perro*"; those of *Echeneis*, "*Pega*." Now, the typical or most important species of each of these groups is further distinguished by the repetition of the same word in an adjective sense. Thus, *Hæmulon plumieri* is "*Ronco Ronco*"; *Lachnolæmus siullus*, "*Perro Perro*"; and *Echeneis naucrates*, "*Pega-pega*." Thus, the true Eel, or Anguilla of the ancients, may be called *Anguilla anguilla*; the typical *Calamus*, *Calamus calamus*, and so on. This rule has been adopted in part by many authors. In his late publications it seems to have been fully adopted by Dr. Günther, who, without any formal statement of reasons, writes *Conger conger*, *Anguilla anguilla*, &c., as he had formerly written *Trachurus trachurus*.

Believing that the retention of the original specific name in all these cases will save much confusion, we propose to call the present species *Calamus calamus*, instead of *Calamus megacephalus*.

The adoption of this rule would necessitate changes in nomenclature of American fishes from that given in our Synopsis of the Fishes of North America—

From—	To—
Catostomus longirostris.	C. catostomus (Forst.).
Anguilla vulgaris.	A. anguilla L.
Conger niger.	C. conger L.
Hippocampus heptagonus.	H. hippocampus L.
Menidia bosci.	M. menidia L.
Sphyræna spet.	S. sphyræna L.
Remora squalipeta.	R. remora L.
Sarda mediterranea.	S. sarda L.
Trachurus saurus.	T. trachurus L.
Calamus megacephalus.	C. calamus C. & V.
Hemilepidotus tilesi.	H. hemilepidotus (Tilesius).
Liparis lineata.	L. liparis L.
Molva vulgaris.	M. molva L.
Lota maculosa.	L. lota L
Merlucius smiridus.	M. merlucius L.
Hippoglossus vulgaris.	H. hippoglossus L.
Achirus lineatus.	A. achirus L.
Mola rotunda.	M. mola L.

3. **Calamus bajonado** (Bloch & Schneider) Poey.—*Jolt-head Porgy*: *Bajonado*.

Bajonado Parra, Peces y Crustaceos de Cuba, 1787, 13, lam. 8 (Havana).

Sparus bajonado Bloch & Schneider, Syst. Ichth., 1801, 284 ("species dubia"; description from Parra); Poey, Synopsis Piscium Cubensium, 1868, 308 (Havana); Poey, Rep. Fis. Nat. Cuba, ii, 160.

Pagellus bajonado Poey, Proc. Ac. Nat. Sci. Phila., 1863, 177 (identification of Parra's figure).

Calamus bajonado Poey, Ann. Lyc. Nat. Hist. N. Y., 1872, x, 176, pl. vi, f. 1 (Havana); Poey, Enum. Pisc. Cubens. 55, 1875 (Havana); Poey, Anales Soc. Hist. Nat. Esp., x, 1881, 328 (Puerto Rico).

Pagellus caninus Poey, Memorias Cuba, ii, 199, 1860 (Havana); Poey, Rep. Fis. Nat. Cuba, 160 (Havana); Guichénot, Rév. Pagels, 123 (name only).

? *Calamus plumatula* Guichénot, Révision Pagels, 119 (Martinique; young).

Head, 3 in length (4 in total); depth 2⅔ (3 in total). D. XII, 12; A. III, 10. Scales, 7–54–17.

Body less elevated than in the two species preceding, the snout long and pointed, the anterior profile rising slowly in an even course to front of dorsal: in the young the anterior profile is more bluntly rounded, the supraorbital region more prominent, and the profile of snout steeper. Greatest depth of preorbital rather more than one-half length of head in adults 2 feet long, 2½ in head in young of 6 inches.

Mouth moderate, maxillary not reaching vertical from orbit except in the young; nearly half length of head in adults; 2½ in head in specimens of 8 inches.

Anterior teeth of outer series much enlarged and stronger than the cardiform band, even in the young; in adults these become very strongly developed, and are then nearly as robust as the molars; their number seems to be normally 2 or 3 on each side in the upper jaw and 3 or 4 on each side in the lower, but this is subject to much variation; the upper jaw has frequently one of these more enlarged than the others, and canine-like. The molars are, as usual in this genus, in three series in the upper jaw and two in the lower; besides these there is quite constantly towards the front of the jaw an interior supplemental series of molars, both above and below. Eye large, 2½ (in young) to 3 (in adults) in length of head.

Dorsal spines slender, the highest 2⅔ in head, the soft rays low; anal spines robust; pectorals long, reaching past origin of anal, 2⅞ to 3 in length; ventrals nearly reaching vent, 1½ in head.

Colors in life.—Brassy, rather dull, and with little blue marking, the middle of each scale shining, but scarcely bluish. A blue stripe below eye, narrower and duller than in the preceding species, and extending well forward on preorbital; a second duller streak above this, the two meeting on forehead. Preorbital dull, coppery, often with irregular and obscure blue lines, these sometimes forming obscure veining, and always growing duller with age. Lower jaw dull, purplish. Angle of mouth purplish and orange yellow. Axil yellowish; no violet band on base of pectoral.

Fins plain, the ventrals sometimes slightly dusky, the caudal obscurely barred.

A young specimen had four or five faint orange blotches along back.

This is the most abundant species of the genus at Key West, and it reaches a considerably larger size than any of the others. The largest specimen seen is 22 inches in length. It is known to fishermen as the Jolt-head Porgy. All the species are equally valued as food, ranking as average in quality with the Grunts (*Hæmulon*), and rather below the Snappers (*Lutjanus*). This species is in life duller in color than most of the other porgies.

In the Havana market this species is proportionately about equally abundant, and it is known as *Bajonado*. The young are also obtained in considerable numbers in the seines at Cojúnar and Marianao. Some ill-informed fish-dealers call the banded young of this and other species "*Sargo*," but that name is never correctly applied to the *Calami*.

Poey's identification of his *Pagellus caninus* with the *Bajonado* of Parra was made on the supposition that the common name, *Bajonado*, is still used for the same species in the Havana market.

4. **Calamus brachysomus** Lockington.—*Mojarra Garabata.*

Sparus brachysomus Lockington, Proc. U. S. Nat. Mus., 1880, 284 (Magdalena Bay, Lower California); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 277 (Pichelnogo, Lower California; name only).

Calamus bajonado Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 107 (Mazatlan; no descr.; not of Poey)

? *Chrysophrys calamus* Günther, Fish. Centr. Amer., 1869, 386 (name only; "Atl. & Pac.; Panama").

This species is abundant in the Gulf of California and in neighboring waters. Numerous specimens are in the National Museum, having been taken by Professor Gilbert at Mazatlan.

5. **Calamus** sp. indescr.—*White-bone Porgy.*

Calamus bajonado Jordan & Gilbert, Syn. Fish. N. A., 1883, 926 (Charleston, S. C.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 604 (Charleston, S. C.). (Not *Sparus bajonado* Bloch & Schneider.)

? *Calamus macrops* Jordan & Gilbert, Syn. Fish. N. A., 1883, 927 (Garden Key, Florida). (Not of Poey.)

This species is at Charleston an abundant and well-known food-fish, reaching a length of 18 inches. There is no positive record of its occurrence elsewhere. There is little doubt of its distinction from *C. milneri* and *C. brachysomus*, but as the published accounts of it above noticed are very meager, and as our own specimens of it have been destroyed by fire, we prefer not to give it a new name until we shall have been able to make a re-examination of specimens.

6. **Calamus penna** (C. & V.) Guichénot.—*Little-mouth Porgy; Sheepshead Porgy.*

Pagellus penna Cuv. & Val., Hist. Nat. Poiss., vi, 209, 1830 (Brazil)? Guichénot, Ramon de la Sagra, Poiss. Cuba, 82 (Cuba).

? *Calamus penna* Guichénot, Révision Genre Pagels, 114 (Brazil; Cuba; Martinique).

Pagellus milneri Goode & Bean, Proc. U. S. Nat. Mus., ii, 134, 1879 (Charlotte Harbor, Florida).

Sparus milneri Jordan & Gilbert, Syn. Fish. N. A., 1883, 556 (copied).

Calamus milneri Jordan & Gilbert, Syn. Fish. N. A., 1883, 928 (Southern Florida).

??? *Calamus macrops* Poey, Ann. Lyc. Nat. Hist. N. Y., 1872, 181, pl. vii, f. 3 (Havana).

Head 3 to $3\frac{1}{4}$ in length: depth $2\frac{1}{6}$ ($2\frac{3}{4}$ in total). D. XII, 12: A. III, 10. Scales 6–48–13.

Body somewhat higher than in *bajonado*. Anterior profile evenly convex to front of dorsal, rising slowly, and not strongly arched. Preorbital low, $2\frac{3}{5}$ to 3 in head, about equaling interorbital width.

Mouth moderate, the maxillary scarcely reaching vertical from front of orbit, $2\frac{1}{2}$ to $2\frac{3}{5}$ in head. Outer series of teeth anteriorly in both jaws somewhat enlarged, small and uniform in size, 8 to 10 in each jaw. No accessory rows of molars in either jaw. Eye rather small, $3\frac{3}{4}$ to $4\frac{1}{3}$ in head in specimens from 6 to 11 inches long.

Dorsal low, the highest dorsal spine about $2\frac{1}{3}$ in head; pectorals about reaching vertical from front of anal, $3\frac{1}{2}$ in length; ventrals $1\frac{2}{3}$ to 2 in head. Scales large, in about 5 vertical series on cheeks.

Color in life.—Smutty-silvery, with some faint large pearly spots on the scales of upper parts of body; preorbital light bluish, plain or with pearly mottlings, but without blue stripes; a faint pale streak above and one just below eye; sometimes a faint dusky bar on cheek below eye. Body with 4 to 6 dark cross-bars about as wide as the interspaces, very distinct in life, and never completely disappearing. Fins plain; the ventrals blackish, sometimes barred; pectoral yellowish, the axil with a small inky spot above.

The *Pagellus penna* Cuv. & Val., from Brazil, may be this species, which it seems to resemble in form and coloration more than any other. The descriptions extant of *penna* are so incomplete, however, that we prefer to retain the name *milneri* rather than to adopt one based on an uncertain identification.*

The young of this species, from 4 to 6 inches in length, are very abundant in the algæ on rocky bottoms about the island of Key West. Numerous specimens were obtained in the seine. These young fishes are called by the fishermen Little-mouth Porgies. A single large individual about a foot in length was obtained from a hook-and-line fisherman. This adult is known as the Sheepshead Porgy. Its cross-bands are more distinct than in the other large species, giving it some resemblance to a Sheepshead (*Diplodus probatocephalus*). The small ink-like spot above the base of the pectorals, and the dusky ventrals, are good color marks of this species.

* Since the above was written we have received from Dr. H. E Sauvage, of the Museum at Paris, an account of the typical specimen of *Calamus penna*. This has the small ink-like black spot in its axil which is characteristic of *C. milneri*. There seems, then, to be no ground for doubting the identity of *C. penna* and *C. milneri*.

7. Calamus macrops Poey.

Calamus macrops Poey, Ann. Lyc. Nat. Hist. N. Y., 1872, 181, pl. vii, f. 3 (Havana).

? Calamus medius Jordan & Gilbert, Syn. Fish. N. A., 1883, 328 (Southern Florida).

This species is unknown to us. As Poey's type had blue lines in the cheek, we refer with doubt the young fish from Southern Florida, described by us (Syn. Fish. N. A., 328) to the present species. The deep-blue spot above base of pectoral attributed to this species is one of the characteristics of *C. milneri*, but that species has the eyes small and the cheek plain.

8. Calamus microps Guichénot.

Salgo (Sargo) Ramon de la Sagra, Album, Peces de Cuba, MSS., tab. 51, 1834.

Pagellus microps Guichénot, Ramon de la Sagra, Hist. Cuba, 188, tab. 3, f. 1 (Havana); Günther, Cat. Fish. Brit. Mus., I, 417, 1859 (copied).

Calamus microps Guichénot, Révision Pagels, 118 (Cuba); Jordan & Gilbert, Syn. Fish. N. A., 1883, 928 (copied).

Pagellus humilis Poey, Syn. Pisc. Cubens., 1868, 308 (Havana).

Grammateus humilis Poey, Ann. Lyc. Nat. Hist. N. Y., 1872, 182 (Havana); Poey, Enum. Pisc. Cubens., 1875, 56.

This species is unknown to us. Its very small eye (.5 in head) would appear to separate it from the other large-scaled species. The water-color drawing of Señor de la Sagra, now before us, is extremely rude, and useless for purposes of comparison.

9. Calamus arctifrons Goode & Bean.—*Grass Porgy; Shad Porgy.*

Calamus arctifrons Goode & Bean, Proc. U. S. Nat. Mus., 1882, 425 (Pensacola); Jordan & Gilbert, Syn. Fish. N. A., 1883, 928 (description from original type); Jordan & Swain, Proc. U. S. Nat. Mus., 1884 (Cedar Key).

Head $3\frac{1}{4}$ in length; depth $2\frac{1}{2}$. D. XII, 12; A. III, 10. Scales 6–46–12.

Body comparatively little elevated, the anterior profile evenly curved, very strongly convex forward; the head is narrowest above, becoming conspicuously wider below: profile rising but little from nape to front of dorsal. Preorbital deep, $2\frac{1}{5}$ to $2\frac{1}{3}$ in head.

Mouth moderate, maxillary scarcely reaching vertical from front of orbit, $2\frac{1}{2}$ in head. Outer series of teeth anteriorly enlarged, conspicuously stronger than those of cardiform band, (8 to) 10 in number in each jaw. Molars in three series above and two below, without accessory inner series. Eye very small, four-fifths interorbital width, one-half width of preorbital, $4\frac{1}{3}$ in length of head.

Dorsal spines compressed and rather strong, the longest $2\frac{1}{2}$ in head. Anal spines short, the third about $4\frac{1}{2}$ in head. Pectoral short, barely reaching vertical from vent, $3\frac{2}{3}$ in length of body. Ventrals about 5 in length. Scales large, in five vertical series on cheeks.

Color in life.—Silvery, bluish or iridescent olive above, the centers

of many of the scales pearly, especially above and between the spots. A conspicuous black blotch on lateral line anteriorly. A row of about six salmon-olive spots along lateral line; above these and below base of dorsal is a row of large faint diffuse blotches of the same color, and below them a series of faint smutty tinges, the whole forming a series of about six obscure and broken cross-bars. Snout olive, mottled with bluish: a bright yellow band between eyes above, a very obscure pearly-blue streak below eye, and two or three similar ones before eye. Preorbital usually bluish, with more or less numerous longitudinal streaks and dashes of golden yellow, around which the ground color forms reticulations: the preorbital sometimes pale salmon yellow, with a few light bluish streaks. Cheeks, preopercle, and opercle pearly, with yellow shades and spots. Opercular membrane coppery orange. Vertical fins bluish, marked with small dusky salmon spots, which form undulating cross-bars on caudal; several blackish spots along base of dorsal. Ventrals, bluish white, faintly barred.

This species is rather common in the eel-grass about the Florida Keys, where it is known as the Grass Porgy, and sometimes as "Shad Porgy," from its occurrence with the "Broad Shad" (*Gerres cinereus*). It is taken in less numbers by the hook-and-line fishermen than the Jolt-head, Littlehead, and Saucer-eye Porgy, and it reaches a larger size than any of these, the largest seen being less than a foot in length. A few were taken in the seine near the shore. A single specimen was obtained by Professor Jordan at Cedar Key. This specimen and one of those taken at Key West have the preorbital plain, as in the original type from Pensacola. Most of the specimens have the preorbital marked with bright dashes, somewhat as in *C. calamus*.

10. Calamus medius (Poey) Jordan & Gilbert.

Grammateus medius Poey, Ann. Lyc. Nat. Hist. N. Y., 1872, 183, pl. vii, f. 4 (Havana); Poey, Enum. Pisc. Cubens., 1875, 56 (Havana).

This species is unknown to us.

INDIANA UNIVERSITY, *January* 25, 1884.

DESCRIPTIONS OF TEN NEW SPECIES OF FISHES FROM KEY WEST, FLORIDA.

By DAVID S. JORDAN and CHARLES H. GILBERT.

The month of December, 1883, was spent by Professor Jordan in making collections of the fishes of Key West, Fla., in the interest of the United States National Museum and of the museum of the Indiana University. About 190 species were obtained, of which those enumerated below appear to be new. Typical specimens of each of these are

in the United States National Museum, bearing in the Museum Register the numbers indicated below.

1. *Dussumieria stolifera.* (Catalogue No. 34964.)
2. *Tylosurus sagitta.* (Catalogue No. 34965.)
3. *Querimana gyrans.* (Catalogue No. 34966).
4. *Atherina aræa.* (Catalogue No. 34967.)
5. *Xyrichthys (Iniistius) rosipes.* (Catalogue No. 34968.)
6. *Doratonotus thalassinus.* (Catalogue No. 34969.)
7. *Gobiosoma ceuthœcum.* (Catalogue No. 34970.)
8. *Cremnobates nox.* (Catalogue No. 34971.)
9. *Platophrys nebularis.* (Catalogue No. 34972.)
10. *Achirus (Bœostoma) comifer.* (Catalogue No. 54973.)

1. Dussumieria stolifera.

Body elongate, slender, moderately compressed, with the shape and general appearance of slender species of *Stolephorus;* belly not compressed to an edge. Snout very sharp, tapering, the jaws equal; cleft of mouth little oblique, the maxillary reaching slightly beyond front of eye, about 2½ in head. Teeth minute, but evident in both jaws. Eye large, 2½ in head. Insertion of dorsal slightly nearer tip of snout than base of caudal: the fin high, the longest ray two-thirds length of head. Insertion of ventrals under fourth or fifth ray of dorsal. Anal low. Ventrals nearly half as long as head, slightly shorter than pectorals, which do not reach their base.

Head 3¾ in length; depth 5½. D. 11; A. 17. Scales rather large, caducous, probably about 36 in a longitudinal series, judging from the impressions on the skin.

Color.—Translucent green, pale below; sides with a well-defined silvery band as in *Atherina* or *Stolephorus*, about one-fourth depth of body and a little broader than pupil; a double row of dots along back before dorsal fin, and a single row behind dorsal; fins plain.

Very abundant in schools in the surf about Key West, in company with *Stolephorus browni.* All the specimens seen were of about the same size, about 1⅔ inches in length. It is probable that it does not attain a larger size.

We should identify our specimens with *Clupea lamprotœnia* Gosse, from Jamaica, were it not for the difference in the numbers of fin rays.

2. Tylosurus sagitta.

Very closely allied to *Tylosurus scapularis* J. & G.

Body slender, not compressed, as broad as deep; caudal peduncle not strongly depressed, its depth about equaling its width; no keel on caudal peduncle; the lateral line not black, and not more conspicuous on tail than elsewhere.

Jaws slender, of moderate length, the upper jaw from eye contained 4½ times in length, and containing length of rest of head 1⅔ times. Diameter of eye about 1⅓ in interorbital width, 2¾ to 3 in postorbital part of head, about 7½ in upper jaw forward from eye.

Teeth slender and pointed, those of inner row about 25 to 30 in each side of each jaw. Teeth and bones of head not green.

Maxillary not entirely concealed by the preorbital. Interorbital space with a long, narrow, rather shallow groove, with a median longitudinal ridge; the groove is scaly and widens slightly anteriorly. Two parallel ridges on occiput.

Cheeks and opercles everywhere closely scaled. No gill-rakers. Scales not green, of moderate size.

Dorsal fin low, the posterior rays the shortest, the longest ray of anterior lobe 1½ in postorbital part of head. Anal higher than dorsal and beginning in advance of it. Caudal fin well forked. Pectorals about equaling length of postorbital part of head. Ventrals about half length of postorbital part of head, the insertion slightly nearer base of median caudal rays.

Head 2⅔ in length; depth about one-sixth head. D. I, 15; A. I, 17. Lat. l. about 225.

Color in life.—Light green above, rendered dusky by fine dots; sides and below whitish silvery; a well-defined dark bluish lateral stripe, narrow and intense toward head, becoming much wider posteriorly. Several dark streaks formed of single series of fine black dots on middle of back. Sides of head, and of body in front of ventral fins, with conspicuous coarse black speeking; these forming a dark bar in front of opercle; angle of mouth dark blue; tip of lower jaw reddish.

Fins all pale; caudal dusky at tip.

Three specimens, from 10 to 13 inches in length, were taken in the seine at Key West.

3. Querimana gyrans.

Close to *Q. harengus*, but differing in coloration, size of scales, fin rays, &c.

Body compressed, especially below; upper anterior profile descending in a curve to the short snout; top of head transversely convex, mouth rather narrow, oblique, the symphysis of lower jaw forming an acute angle. Teeth in a single series in upper jaw, rather better developed than in species of *Mugil*, but not evidently of different character. Eye large, equaling interorbital width, 3⅔ in head, about twice length of snout.

Origin of ventral fins midway between snout and end of anal fin; pectorals long, five times in length of body; vertical fins, apparently scaleless.

Head 3¼ in length; depth 3¾. D. IV–I, 7; A. II, 7 (or 8?). Lat. l. 28 or 29.

Color.—Some specimens (perhaps females) green above; sides and belly, silvery; middle of back with a large pale area, shining silvery when in the water. Other specimens (perhaps males) with a broad coppery olive shade along the sides, extending on the back; color otherwise the same; the pale dorsal blotch as in the other. Fins, pale.

This little fish was found to be very abundant about the market wharves at Key West, apparently feeding on the waste fishes thrown overboard by the fishermen. None of the many specimens obtained are more than three fourths of an inch long, nor is it likely that the species attains a much greater size.

The fishes swim about in schools of about 50 at the surface of the water, the school having often something of a rotary motion like a school of whirligig beetles (*Gyrinidæ*). When so swimming the pale spot on the back is very conspicuous, and the bronze-colored ones (males?) are readily distinguished from the green ones. When alarmed, the whole school sinks to the bottom. All the specimens obtained were dipped up with a pail from the boats.

It is probable that the specimens obtained at Charleston, and referred by us to *Querimana harengus*, belonged to this species. Unfortunately they have been destroyed.

4. Atherina aræa.

Body very slender, compressed, the head slender and narrow, with sharply-pointed snout; mouth oblique, narrow, maxillary barely reaching vertical from front of orbit, $2\frac{2}{3}$ in head; eye large, equaling interorbital width, $2\frac{2}{3}$ in head; scales moderate, entire.

Origin of spinous dorsal midway between tip of snout and base of caudal, much behind end of pectorals, about opposite tip of ventrals; length of pectorals equaling depth of body; ventrals half length of head; bases of vertical fins concealed in a sheath of scales.

Head $4\frac{1}{2}$ in length; depth 6. D. VI–1, 9; A. 1, 12. Lat. l. 38 to 42.

Color.—Translucent olive-green, the snout and mandible dusky; back with a median series of black specks, one on each scale; a similar series on each side the median row; no dark specks on sides; lateral silvery band broad, occupying the greater part of the third row of scales, its width half diameter of orbit: a dusky area behind vent; a series of black specks along base of anal, and thence along caudal peduncle to tail.

This species is rather common about Key West, in company with its larger and much more abundant congener, *A. stipes* Müll. & Trosch., (=*A. laticeps* Poey, *A. reliana* Goode & Bean.) None were obtained of more than 2 inches in length.

5. Xyrichthys rosipes.

Body sharply compressed and of moderate height, the anterior profiles not compressed to a sharp edge, the upper profile descending in a regular gentle curve from dorsal fin to end of snout, thus much less nearly vertical than in most species of the genus; the snout comparatively long and pointed, the preorbital low; maxillary nearly reaching vertical from front of orbit, $3\frac{1}{2}$ in head; teeth as usual, no posterior canines; height of preorbital $5\frac{1}{3}$ in head; eye large, $1\frac{1}{2}$ times interor-

bital width, $3\frac{2}{3}$ in head (in young); distance from snout to eye one-third head; a series of small scales below eye, head otherwise naked.

Two anterior dorsal spines, much elevated, with filamentous tips, their length two-thirds that of head; the third or fourth spine is the lowest, the spines thence slightly increasing to the last; second spine connected by membrane with the third: longest soft ray of dorsal about $2\frac{3}{4}$ in head: caudal rounded, $1\frac{1}{3}$ in head: ventrals $1\frac{1}{3}$; pectorals $1\frac{1}{2}$.

Head $3\frac{2}{5}$ in length; depth $3\frac{1}{5}$. D. IX, 13; A. III, 12. Lat. l. 23 or 24.

The specimen described above, 2 inches long, had the following coloration in life: Light olive, scarcely paler below, the head more yellowish; body with five irregular brownish cross-bars, the first obscure, at the nape: the last forming a blotch at base of caudal; a small yellowish spot at middle of base of caudal and a fainter one above it; a dark olive band downward from eye, with a spot-like band of the same color before it, and another, which becomes yellow, on the cheeks behind it: all three of these pass around the lower jaw: an olive blotch on opercle: some brown dots behind eye: dorsal cherry red, paler posteriorly, darkest on the produced anterior rays: caudal pale, scarcely tinged with reddish: anal cherry red, the lateral stripes forming two spots of deeper red on the fin; pectoral plain; ventrals deep cherry red.

A second specimen, smaller in size, probably the female of the species, had a different coloration, as follows: Orange brown, everywhere much mottled, the edges of many scales being brown, the brown becoming yellowish on lower parts, five brown cross-bands darker and broader than in the other specimen, the first at nape, the last at base of caudal, ending behind in a sharply-defined convex curve. Two yellowish brown bands across from eye over lower jaw. Tip of lower jaw of the same color; two similar bands across breast before ventrals. Dorsal and anal transparent except where crossed by the bands. Caudal and pectorals plain, ventrals deep brownish red.

Two specimens were obtained with the seine in the surf at Key West.

6. Doratonotus thalassinus.

Body much compressed, moderately elevated; its greatest width behind head two-sevenths of its height; caudal peduncle short and deep; its length but little more than half its height: profile from dorsal to nape convex, carinated: occiput and supraorbital region depressed and flat, the snout protruding, the profile of top of head thus strongly concave.

Snout slender, sharp, compressed, its length $3\frac{1}{3}$ in head: mouth wide: maxillary, 4 in head; teeth growing gradually larger anteriorly, the two front teeth in each jaw, distinctly the largest, canine-like, diverging, opposed to each other: a small but distinct posterior canine in upper jaw, none in the lower: eye moderate, little wider than interobital width, 5 in head: cheeks with a single series of large scales, 4 in num-

ber; opercle covered with 5 or 6 similar scales; gill-membranes broadly united, free from the isthmus.

Dorsal spines robust and pungent, the first three with conspicuous filamentous appendages; first and second spines with their filaments about equal, 1½ in head; without their filaments the second spine is slightly the longest, equaling distance from end of snout to middle of eye; the fin rapidly descends to the fourth spine, which is one-half as long as the second, then gradually rises to the ninth and highest, which is, however, shorter than the following soft rays; longest soft ray, 1⅔ in head; anal spines similar to those of dorsal fin, the longest about one-half head; caudal evenly convex, its longest ray 1½ in head; ventrals short, about one-half length of head, an elongate scale between them at base; pectorals reaching beyond the ventrals, but not to vent, 1¾ in head.

Membranes of vertical fins, with elongate scales on basal portion. Lateral line following outline of back one scale beyond end of dorsal fin, thence interrupted and continued on four scales of middle of caudal peduncle.

Head, 2⅞ in length; depth, 2⅔. D. IX, 10; A. III, 9; Scales 1½—20 (pores)—6½.

Color in life.—Very intense grass-green, about uniform over the body; head more yellowish, slightly paler below; opercles mesially a little darker; iris red, with a green ring; dorsal, anal, and caudal grass-green, mottled with light orange; tips of longer spines green, of short ones orange; ventrals, deep green, the membranes largely orange; pectorals, light yellowish.

A single specimen, 2⅜ inches in length, of this most beautiful species, was obtained with the seine in eel grass at Key West.

7. Gobiosoma ceuthœcum.

Body slender; head depressed, flat above, narrow and slender; eyes large, the interorbital space very narrow; snout not blunt; mouth terminal, oblique, maxillary reaching to below eye, about one-third length of head; chin with a fringe of short, whitish barbels, arranged in two rows; eye large, rather more than one-fourth length of head, about three times interorbital width.

Vertical fins high, none of the rays or spines produced; membrane of last dorsal spine reaching origin of soft dorsal; pectorals long, reaching vertical from vent, one-fourth length of body; none of the upper rays silk-like. Ventral not reaching vent, one and five-sixths in head. Head and body scaleless.

Depth one-half head, which is three and two-thirds in length. D. VII, 10; A. 10.

Upper half of head and body of a warm brown, being covered with very close-set, coarse, brown specks; four oblong, colorless areas along base of dorsals, and a smaller one on back of caudal peduncle; head and body below translucent, this meeting the brown in a sharply de-

fined line along middle of sides; back with five or six blackish cross-bars from back to middle of sides, below which they extend in five or six short V-shaped projections: a short brown streak backwards and downwards from eye; a small brown bar obliquely across base of upper pectoral rays: a broad jet-black bar across base of caudal, not including uppermost and lowermost caudal rays.

A single specimen 1 inch in length was taken from a cavity of a sponge at Key West. It is possible that it should be regarded as the type of a genus distinguished from *Gobiosoma* by the presence of the small mental barbels.

8. Cremnobates nox.

Snout not very acute, the upper and lower profiles of head nearly evenly convex; mouth large, maxillary reaching slightly beyond eye, one-half length of head. Eye large, equaling length of snout, greater than interorbital width, 4 in head (to end of opercular spine); interorbital width, 4¾ in head; nasal, supraorbital and occipital tentacles present; those on snout and above the orbits, simple, slender filaments, the latter about as long as diameter of orbit, one of them divided to the base, the other simple; the tentacle on each side of nape is a compressed slip of skin higher than wide, the margin uneven but not fringed.

Anterior dorsal spines not much elevated, not higher than some of the posterior spines: the first and second spine about equal, 2½ in head; the third spine is shorter, about equal in length to the fourth, from which it is separated by a wide membrane, which is, however, not at all notched. The spines thence increase in length toward the last. Caudal 1⅓ in head; pectorals reaching anal, nearly equaling length of head: ventrals not reaching vent, 1⅕ in head.

Scales large, 4 series above lateral line and 4 below.

Head 3⅔ in length: depth 3⅔. D. III+XXVII; A. II, 18. Lat. l. 34 (tubes).

Color.—Body and fins uniform blackish brown; a few small silvery-white specks on dorsal region, mostly along base of dorsal fin; head and base of pectoral fin with light pink areas and mottlings; snout pink above; nape with a pink cross-bar; a dark streak upwards and backwards from eye to nape; a light streak from eye backwards to opercle and one backwards and downwards: lower jaw mottled with light and dark. A small round, black spot, near base of dorsal between twenty-third and twenty-fifth spines, and one between twenty-eighth and thirtieth, both very faintly ocellated with lighter. Slight whitish tips on ventrals and lower edge of caudal.

This species is known from a single specimen, 1¾ inches long, taken with the seine in algæ on a rocky bottom at Key West. Its congeners, *C. marmoratus* Steind., *C. fasciatus* Steind., and *C. affinis* Steind., were found in the same waters, *C. marmoratus* being much the most abundant of the four, and reaching the largest size.

9. Platophrys nebularis.

Body ovate, deep anteriorly, the profile descending steeply, rendered abruptly concave in front of interorbital space by the conspicuously projecting short snout. Mouth very small and oblique, the maxillary reaching vertical from front of lower eye, $3\frac{3}{4}$ in head; tip of lower jaw entering the profile. Teeth fine, conical, in two series in the upper jaw, one in the lower: those of the outer row in upper jaw larger and more widely separated than those of the inner series.

Snout very short, about one-fifth head, equaling interorbital width. Interorbital space narrow, deeply concave, closely scaled. Eyes large, the lower in advance of upper, its diameter $3\frac{2}{3}$ in head. Gill-rakers obsolete, 7 rudiments on horizonal branch of anterior arch.

Scales moderate, not extending on the fins, those on colored side ctenoid, those on blind side smooth. Arch of lateral line short and high, its base contained $4\frac{1}{2}$ to 5 times in the straight portion.

Dorsal beginning opposite anterior nostril, the rays nearly uniform in length, the longest about half head. Pectoral of colored side $4\frac{3}{4}$ in length. Ventral of colored side beginning under middle of lower eye, with six rays; the right ventral with five rays.

Head 4 in length; depth $1\frac{1}{2}$. D. 85; A. 64. L. lat. 75 (pores).

Color in life.—Light grayish with reddish tinge, covered with small round spots of darker gray and with lighter rings inclosing spaces of the ground color. Vertical fins similarly colored, with a small black spot near base of each ninth or tenth ray. Two black spots on median line of body divide the length into nearly equal thirds; some other small black spots scattered over colored side.

This species is very common at Key West in clear, shallow water on sandy bottom. The largest of the numerous specimens taken is 3 inches in length.

The name *Platophrys* has priority over that of *Rhomboidichthys* Bleeker. We have therefore adopted it instead of the latter.

10. Achirus comifer. Subgenus **Bæostoma** Bean.

Eyes small, nearly twice the interorbital space, 6 in head. Pectoral of colored side well developed, half as long as head; that of blind side wholly wanting in all our specimens. Dorsal and anal of equal height, the posterior rays longest, two-thirds length of head. Caudal rather sharply pointed, slightly more than one-third length of body.

Scales small, those on front of head and along back anteriorly enlarged and spinous, the largest perhaps three times as large as those on sides. Right side of body beset with conspicuous black ciliæ, some of them clustered together; six of these clusters are more evident than the others, three above and three below lateral line.

Head $3\frac{1}{4}$ in length; depth $1\frac{3}{5}$. D. 50; A. 37. Scales in 65 oblique series.

Head, body, and fins somewhat mottled with varying shades of olive-gray, some of the darker marking with a tendency to form vertical lines:

entire body and fins also with round blackish spots of various sizes. Posterior half of blind side dusted with fine dark points.

Four specimens, varying from 1 to 2½ inches long, were taken with the seine at Key West. They occur on sandy bottoms in shallow waters.

INDIANA UNIVERSITY, *February* 15, 1884.

NOTE ON CARANX RUBER AND CARANX BARTHOLOMÆI.

By DAVID S. JORDAN and CHARLES H. GILBERT.

In our Review of the American Carangina (Proc. U. S. Nat. Mus. 1883, 188–207), we have provisionally referred (p. 198) the names *Caranx bartholomæi* C. & V., *Caranx cibi* Poey, *Caranx iridinus* Poey, and *Caranx beani* Jordan, to the synonymy of *Caranx ruber* (Bloch) = *Caranx blochi* C. & V. An examination of many specimens collected by Professor Jordan of the "*Cibi amarillo*" (*Caranx cibi* Poey) and the "*Cibi carbonero*" (*Caranx iridinus* Poey) of the Havana markets shows that the two species are really distinct, although closely related. The "*Cibi carbonero*" is more elongate than the "*Cibi amarillo*," the depth in specimens a foot long, 3½ in length; the head smaller, 3⅔ in length, the straight portion of the lateral line longer, considerably longer than curved part, 2½ in body. In color it is bluish olive, silvery below, scarcely tinged with yellow in life; a vaguely defined horizontal stripe of clear blue just below the dorsal fin. Dorsal yellowish gray; other fins dusky olive: a distinct blackish bar extending the length of the lower lobe of the caudal.

In the "*Cibi amarillo*" (called Yellow Jack at Key West) the body is rather deep, the depth in specimens a foot long, 2⅔ in length: the head 3⅓; the straight part of the lateral line scarcely as long as curved part, 2⅔ in head. The color is bluish silvery in life, everywhere strongly washed with golden; the young sometimes with round golden spots: blue stripe along side of back very faint or obsolete: yellow brightest on back, on iris, and along base of anal: fins all pale yellow, the color most intense on anal and ventrals: no blackish stripe on lower lobe of caudal.

In numbers of fin rays and scutes, in dentition, and in form of the fins, the two agree very closely. The soft dorsal and anal, although very low anteriorly, are in both slightly falcate. Our analysis of species on page 194 is therefore erroneous as regards these species.

The following is an outline of the synonymy of the two species, which may be amplified by reference to page 198:

Caranx ruber (Bloch) Jor. & Gilb.—*Cibi carbonero; Cibi mancho.*
Scomber ruber Bloch, Ichth. taf. 342.
Caranx blochi Cuv. & Val. ix, 69, 1833.
Caranx iridinus Poey, Mem. Cuba, II, 226, 1860.
West Indies.

Vol. VIII, No. 3. Washington, D. C. June 3, 1884.

Caranx bartholomæi, Cuvier & Valenciennes.—*Cibi amarillo; Yellow Jack.*
Caranx bartholomæi Cuv. & Val. ix, 100, 1833.
Caranx cibi Poey, Mem. Cuba, II, 224, 1860.
Caranx beani Jordan, Proc. U. S. Nat. Mus., 1880, 486.
West Indies, north to Key West, Fla., and Beaufort, N. C.

We have also examined the original drawings made by Poey of his *Hynnis cubensis*. This is, we think, not identical with *Caranx crinitus*, but a valid species, closely allied to *Caranx alexandrinus* (= *Hynnis goreensis* C. & V. = *Gallichthys ægyptiacus* Ehrenberg). It may stand as *Caranx cubensis*.

The drawings of *Seyris analis* Poey, examined by us, are taken from a large specimen. This agrees with specimens of equal size of *Caranx crinitus* in all respects, except that the anterior anal rays are not elevated in a lobe. We do not know how to account for this, but cannot believe that it indicates a difference of species.

The name "*Chloroscombrus stirurus*" on pages 206 and 207 is a *lapsus* for *C. orqueta*. It is the MSS. name by which we at first designated the latter species.

INDIANA UNIVERSITY, *February* 25, 1884.

NOTES ON A COLLECTION OF FISHES FROM PENSACOLA, FLORIDA, OBTAINED BY SILAS STEARNS, WITH DESCRIPTIONS OF TWO NEW SPECIES (*Exocætus volador* and *Gnathypops mystacinus*.)

By DAVID S. JORDAN.

About January 1, 1884, a tank of fishes was sent to the museum of the Indiana University by Mr. Silas Stearns, of Pensacola. This collection was made up of fishes taken with hook and line on the "Snapper Banks," in water of considerable depth, and also of small fishes taken from the stomachs of the Red Snappers or "spewed up" by the latter after being brought on the deck. Some of these small fishes in the present collection, as in others made by Mr. Stearns, are of special interest.

1. **Letharchus velifer** Goode & Bean.

Plum color in spirits, the head paler, but the belly dark; dorsal white, its edge abruptly blackish.

2. **Ophichthys chrysops** Poey.

3. **Myrophis punctatus** Lütken.

4. **Clupea pseudohispanica** (Poey) Günther.

This specimen seems to agree fully with others obtained by me in the Havana market.

5. Parexocœtus mesogaster (Bloch) J. & G.

(*Exocœtus hillianus* Gosse.)

This species has teeth on the palate, as Dr. Lütken has observed, and is therefore a "*Parexocœtus.*" The second ray of the pectoral is divided, not simple as stated by us, (*lapsus calami*), Proc. U. S. Nat. Mus. 1882, 263.

6. Exocœtus volador, sp. nov.

Head $4\frac{1}{2}$ in length to base of caudal; depth $5\frac{3}{4}$. D. 11; A. 11; Lat. l. about 45. Length of type, $9\frac{1}{4}$ inches.

Allied to *Exocœtus rondeleti*, but with the first and second rays of the pectoral simple.

Body rather stout, moderately compressed; head broad, not very obtuse in profile; eye moderate, $3\frac{1}{3}$ in head; interorbital space slightly concave, its width $2\frac{1}{2}$ in head. Pectoral fin broad, reaching to the base of the upper lobe of caudal; first ray of pectoral barely half length of the fin; second ray also simple, about two-thirds length of fin; third ray divided, shorter than fourth, ventrals reaching to the next to the last ray of anal, $3\frac{2}{3}$ in body; insertion of ventrals slightly nearer gill-opening than base of caudal. Caudal long, its lower lobe $1\frac{2}{5}$ length of head; dorsal fin low, its insertion a little in advance of insertion of anal, the base of the latter being $1\frac{1}{4}$ times in that of the former; longest rays of dorsal $2\frac{2}{5}$ in head; longest of anal rather less.

COLOR.—Dark bluish above, belly white; dorsal and caudal plain dusky; pectoral black, darker near the edges; ventrals mesially black, the edges white.

A single specimen in fine condition was sent by Mr. Stearns. It has been presented to the United States National Museum, where it is numbered 34975. In Dr. Lütken's excellent review of the Flying-fishes (Bidrag. til Flyvefiskenes Diagnostik (Vidensk. Meddel. Naturh. Foren. 1876, 394), this species would be placed under "*b. Radius secundus pectoralis, simplex,*" but it differs in many respects from *E. brachycephalus* Gthr. and *E. lamellifer* Kner. & Steind., the two described species of that type known to Dr. Lütken.

7. Sphyræna guaguanche Cuvier & Valenciennes.

8. Echeneis naucrates Linnæus.

9. Euthynnus alliteratus (Rafinesque) Jor. & Gilb.

10. Decapterus punctatus (Agassiz) Gill.

11. Caranx amblyrhynchus Cuv. & Val.

(*Caranx falcatus* Holbrook; *Caranx secundus* and *C. heteropygus* Poey.)

12. Caranx setipinnis (Mitchill) Jor. & Gilb.

13. Stromateus triacanthus Peck.

One young specimen, apparently the first taken in the Gulf.

14. Chloroscombrus chrysurus (L.) Gill.

15. Rhypticus saponaceus (Bloch & Schneider) Cuv. & Val.

(*Eleutheractis coriaceus* Cope, Trans. Am. Phil. Soc. 1870, 467.)

A single specimen from the stomach of a Red Snapper. This is the first record of this species from the waters of the United States. There is nothing in the description of *Eleutheractis coriaceus* Cope to indicate specific, much less generic difference. Our specimen agrees well with the figure of the latter, being, however, a little more slender. D. III, 25; A. 15 or 16.

16. Rhypticus maculatus Holbrook.

Dusky brown, somewhat clouded; sides with a few small, irregular white spots; fins dusky, the edge of the caudal pale.

Body deep; maxillary reaching to below posterior margin of eye, $2\frac{2}{3}$ in head. Head 3 in length; depth $2\frac{1}{3}$. D. II, 25; A. 14 or 15.

17. Epinephelus stomias (Gobde & Bean) Jor. & Gilb.

18. Serranus phœbe Poey.

A young specimen, the first recorded from the waters of the United States. It agrees very well with a Cuban specimen, but the white preanal band is rather narrower in the latter.

19. Serranus formosus (L.) Jor. & Gilb.

(*Serranus fascicularis* C. & V.)

A single young specimen. In the young of this species the edge of the preopercle forms a nearly even curve, armed with a strong spine. Only in the adult is the characteristic division of these spines in two sets, which suggested the name *Diplectrum*, developed.

20. Lutjanus caballerote (Bloch) Poey.

(*Lutjanus stearnsii* Goode & Bean; *Lutjanus caxis* (young), and *Lutjanus stearnsi* (adult), Jordan & Gilbert, Proc. U. S. Nat. Mus. 1882, 275; *Lutjanus caxis, stearnsi,* and *caballerote* Jordan & Gilbert, Syn. Fishes N. A., 548, 549, 921.)

I am unable to separate *Lutjanus stearnsi* from the common Gray Snapper, Mangrove Snapper, or *Caballerote* of the West Indies, a species to which we have hitherto applied the erroneous name of *Lutjanus caxis*. The latter species, the Dog Snapper, Schoolmaster, or *Cají* of the Florida fishermen, has not yet been noticed north of Key West. The synonymy of this and related forms has been much entangled. I hope later to give a review of this genus, in which the relations of these different snappers will be fully worked out. The true *caxis* has the posterior part of the body and the caudal fin bright orange or yellow.

21. Lutjanus campechianus Poey.

(*Lutjanus blackfordii* Goode & Bean.)

I have examined large numbers of specimens of the "Red Snapper" or "*Pargo Guachinango*" in the Key West fishing smacks and in the markets of Havana, and I do not think that there is the slightest room for doubt of the identity of this fish with the Red Snapper of Pensacola,

or *Lutjanus blackfordi*. It is therefore certain that in his account of the *Mesoprion campechianus* (Memorias Cuba, II, 149), Professor Poey intended to describe the Red Snapper, and that it is to this fish that all subsequent references made by him to *Lutjanus* or *Mesoprion campechianus* should be assigned.

The original type of Professor Poey, No. 71, "370 mill." long, is a stuffed skin of a young specimen, mounted by Poey nearly thirty years ago, and now preserved in the University of Havana. This has been cursorily examined by me, but it being locked behind glass doors at a considerable height from the floor, I took no notes save that it resembled a young Red Snapper, and that the eye appeared large, about 4 in head.

Comparing Poey's description with a young Red Snapper, I notice the following discrepancies: "L'œil est quatre fois dans la longueur de la tête. Je compte 65 écailles au-dessus de la ligne latérale, 53 au-dessous." In a specimen of similar size, I find the scales as above counted $\frac{65}{53}$, and the eye $4\frac{2}{3}$ in head. The account of the color, as given by Poey, applies very well to the young Red Snapper. In these, the lateral dark blotch is large, disappearing when the fish is about 15 inches long. The bluish lines along the rows of dorsal scales disappear earlier. Specimens of 4 to 6 inches are olive rather than red.

At present, I think that Professor Poey's identification of his type with the "*Pargo Guachinango*" is correct, but I cannot consider this opinion positively established.

22. Rhomboplites aurorubens (Cuv. & Val.).

(*Mesoprion elegans* Poey, Memorias Cuba, II, 153.
Aprion ariommus Jordan & Gilbert, Proc. U. S. Nat. Mus. 1883, 142.)

There is not much doubt that the mutilated fishes from the stomachs of the Snappers described by us as *Aprion ariommus*, are the young of *Rhomboplites aurorubens*. The types of the former species were unfortunately destroyed in the burning of the museum building of the Indiana University, July 12, 1883.

I have obtained numerous specimens of the "*Cagon*" (*Rhomboplites elegans* Poey) in the Havana market. I find no difference between these and the Pensacola specimens, nor do I believe either to be different from the original *aurorubens* of Cuvier.

As this species, in addition to its other peculiarities, has a well-defined patch of pterygoid teeth, the genus *Rhomboplites* may perhaps be be retained for it.

23. Sparus pagrus Linnæus.

I very much doubt the identity of this fish with the European species, but I have as yet had no opportunity for making a direct comparison of the two.

24. Apogon maculatus (Poey) Jor. & Gilb.

25. Micropogon undulatus (Linnæus) Cuv. & Val.

The West Indian *Micropogon* is in my opinion a species distinct from *M. undulatus*. It should apparently stand as *M. fournieri* (Desmarest).

Specimens from the Havana market differ from Pensacola specimens as follows:

Body in *M. fournieri* more elongate, the depth 3⅓ in length to base of caudal, in a specimen 16 inches long. Dorsal rays X—1. 30, A. II. 7. Lateral line with 54 tubes, the scales in 62 oblique rows; 7 scales in a vertical series from first dorsal spine to lateral line: 9 or 10 in an oblique series (9 in a vertical series in *M. undulatus*; 13 in an oblique series). Dorsal spines higher, the longest 1¾ in head: pectoral shorter, 1⅓ in head. The color is notably different. The short vertical bars exist along the lateral line in both species, but above these, in *M. fournieri*, are very distinct undulating lines, formed of dark centers to the scales, these making continuous dark streaks as wide as the pale interspaces. The streaks are distinct on the whole back. (In *M. undulatus*, the dark spots are fewer and scattered, not forming continuous stripes.) Opercle with a dusky shade. Both dorsals pale, without evident spots, the tips dusky.

The outer teeth are rather weaker in *M. fournieri*. The size of the eye and the form of the preopercle are essentially alike in both.

26. Chromis enchrysurus Jor. & Gilb.

27. Platyglossus caudalis (Poey) Günther.

Our specimens from Pensacola agree equally well or ill with *Julis caudalis* Poey, Mem. Cuba, II, 213, *Julis pictus* Poey, l. c. 214, and *Platyglossus poeyi* Steindachner, Ichth. Notiz. VI, 49. It is possible that four closely related species exist, each with a blackish spot behind the eye, and the outer rays of the caudal produced. More probably, the four are identical.

28. Decodon puellaris (Poey) Günther.

A small specimen, in rather poor condition, from the stomach of a Red Snapper. This is the first record of this interesting species from the waters of the United States.

29. Caulolatilus microps Goode & Bean.

A large specimen, agreeing very exactly with the description given by Goode & Bean. The separation of this species from *C. chrysops* appears questionable, but, until more is known of the latter species, it is best to consider the two as distinct. The small size of the eye in *C. microps* is doubtless due to the very large size of the only specimens examined.

30. Gobius soporator Cuv. & Val.

31. Ioglossus calliurus Bean.

Specimens in good condition.

32. Gnathypops mystacinus sp. nov.

Head 3½ in length (3⅔ to tip of caudal); depth 4⅕ (5⅔). D. 23 or 24; A. 11. Lat. l. with about 54 tubes; 100 scales between gill-opening and caudal. Length of type 3½ inches.

Head rather elongate, not very blunt in profile; snout very short, not longer than pupil; eye large, about $3\frac{1}{3}$ in length; maxillary $1\frac{2}{3}$ in length of head, 5 in length to base of caudal, $6\frac{1}{3}$ in total length to tip of caudal; end of maxillary abruptly truncate, not ending in a flexible lamina, the supplemental bone well developed; lower jaw slightly included. Teeth in both jaws in a narrow band, the outer slender, enlarged; vomer with about 4 slender teeth; palatines toothless. Gill-rakers long and slender. Gill membranes nearly separate, free from the isthmus.

Scales very small; lateral line extending to below anterior part of soft dorsal, its length $\frac{5}{4}$ that of head.

Dorsal spines not distinguishable from the soft rays, the rays apparently fewer than usual, none of them very high, the last ray $2\frac{1}{4}$ in head. Caudal short, apparently truncate, $1\frac{1}{4}$ in head. Anal rather low. Pectorals 2 in head. Ventrals $1\frac{3}{4}$.

Color.—Somewhat faded; apparently plain olive green, without bands or spots on body or fins. Vertical fins tipped with blackish. Maxillary with a median blackish stripe. Pectoral with two dusky cross-shades. No black or white on lining membrane of jaws.

A single specimen in good condition, spewed up by a Red Snapper at Pensacola. It is numbered 34976 on the National Museum Register.

This species resembles *O. lonchura* in color, but is quite different in other respects.

33. Emblemaria nivipes Jordan & Gilbert.

A large specimen sent us by Mr. Stearns was presented to the United States National Museum (No. 33915). It was carefully compared with our types of *E. nivipes* from Panama, by Dr. Bean, who found no difference of importance. It is therefore provisionally identified with *E. nivipes*. The occurrence of this form in Florida waters is interesting.

34. Peristedium imberbe Poey.

A small specimen, with the head and caudal fin mostly digested, was taken from the stomach of a Snapper. It does not altogether agree with Poey's account; but as that, too, was taken from a mutilated specimen, I attach little weight to the discrepancies. The lower jaw being destroyed, I can say nothing of the barbel; but from the presence of hooked spines on the lower row of plates, I think that this specimen must be different from *P. brevirostre* Günther.

Our specimen has four rows of spinous plates on each side; the occipital spines strong. D. VI—*ca.* 1, 9.

Scutes 30 in each series.

35. Scorpæna stearnsi Goode & Bean.

36. Citharichthys pætulus (Bean) Jor. & Gilb.

Two specimens, each about a foot in length, in fine condition. The right side, in this species, is sooty-blackish, not pale as usual in flounders.

As two of the species of *Hemirhombus* (*H. fuscus* Poey, and *H. ovalis* Günther) have the narrow interorbital space, the short pectoral, and the general appearance of the species of *Citharichthys*, I cannot admit the genus *Hemirhombus* to be well founded. In *Hippoglossoides* are also species with one, and others with two rows of teeth.

37. Alutera schœpfi (Walbaum) Goode & Bean.

A large specimen, apparently identical with others from Wood's Holl, Mass. D. I, 34; A. 40.

38. Balistes carolinensis Gmelin.

(*Balistes vetula*, β. Balistes carolinensis Gmelin, Syst. Nat., 1788, 1468.
? *Balistes capriscus* Gmelin, Syst. Nat., 1788, 1471; based on references to various authors; several species evidently confounded.
Balistes capriscus of most recent authors.)

It seems certain that the *Balistes capriscus* of Gmelin is not specially based on the present fish, while the prior name, *carolinensis*, of the same author, refers evidently to this species. This is shown by the numbers of the fin rays, by which this species may be known from *B. vetula*. We therefore adopt the name *carolinensis* instead of *capriscus*.

The following species, new to the fauna of the United States, are contained in the present collection:

Exocœtus volador sp. nov., *Rhypticus saponaceus*, *Serranus phœbe*, *Decodon puellaris*, *Gnathypops mystacinus*, *Emblemaria nivipes*, *Peristedium imberbe*.

NOTE.—The following is a list of the species thus far found by Mr. Stearns in the stomachs of the Snappers and Groupers on the "Snapper Banks," off Pensacola. This list represents the sum total of our knowledge of the fishes of the Gulf of Mexico, other than those living close to the shores, or those sought for food. Of the abyssal fauna of the Gulf absolutely nothing is yet known.

Sidera ocellata (Ag.).
Myrophis punctatus Lütken.
Ophichthys ocellatus (Le Sueur).
Ophichthys schneideri Steind.
Ophichthys chrysops Poey.
Letharchus velifer Goode & Bean.
Conger caudicula Bean.
Myrophis punctatus Lütken.
Clupea pseudohispanica (Poey).
Synodus? cubanus Poey. (=*S. intermedius* J. & G., Proc. U. S. Nat. Mus. 1882, 249; not of Agassiz & Spix.)
Parexocœtus mesogaster (Bloch).
Exocœtus volador Jordan.
Exocœtus noveboracensis Mitchill.
Apogon maculatus (Poey).
Apogon alutus Jor. & Gilb.
Serranus formosus (L.).
Serranus philadelphicus (L.).
Serranus phœbe Poey.
Serranus subligarius (Cope).
Rhypticus saponaceus C. & V.
Rhypticus maculatus Holbrook.
Rhomboplites aurorubens (C. & V.).
Hæmulon aurolineatum C. & V.
Stenotomus caprinus Bean.
Mullus auratus Jor. & Gilb.
Stromateus triacanthus Peck.
Nomeus gronovii (Gmel.).
Chloroscombrus chrysurus (L.).
Decapterus punctatus (Ag.).
Trachurus trachurus (L.).
Scomber colias Gmel.
Trichiurus lepturus L.
Chromis enchrysurus Jor. & Gilb.
Chromis insolatus (C. & V.).

Platyglossus caudalis (Poey).
*Platyglossus bivittatus (Bloch).
Decodon puellaris (Poey).
†Xyrichthys? lineatus (L.).
Scorpæna stearnsi Goode & Bean.
Prionotus scitulus Jor. & Gilb.
Peristedium imberbe Poey.
Ioglossus calliurus Bean.
Batrachus pardus Goode & Bean.
Opisthognathus lonchura Jor. & Gilb.
Gnathypops mystacinus Jordan.
Emblemaria nivipes Jor. & Gilb.
Blennius stearnsi Jor. & Gilb.
Ophidium omostigma Jor. & Gilb.
Ophidium beani Jor. & Gilb.
Ophidium marginatum Dekay.
Citharichthys pætulus (Bean).
Siphostoma zatropis Jor. & Gilb.
Hippocampus stylifer Jor. & Gilb.

INDIANA UNIVERSITY, *January* 25, 1884.

NOTE ON ÆLURICHTHYS EYDOUXII AND PORICHTHYS POROSISSIMUS.

By DAVID S. JORDAN.

In the fifteenth volume of the Histoire Naturelle des Poissons, page 43, Valenciennes describes, in a very brief and insufficient manner, a Catfish from Guayaquil, under the name of *Galeichthys eydouxii*. Suspecting that this species might be identical with *Ælurichthys pinnimaculatus* Steind., I wrote to Dr. H. E. Sauvage, of the Museum at Paris, for information concerning the type of *G. eydouxii*. The following is a translation from the letter received by me from Dr. Sauvage:

"I have before me the type of *Galeichthys eydouxii* Cuv. Val., coming from Guayaquil, through Eydoux. It is a fish of 0m.225 in length, the head 0m.047, the breadth 0m.035. The species is very near to *Ælurichthys pinnimaculatus* (Steindachner Ichth. Beitr. IV, p. 25, pl. VIII). It is, however, distinct, and differs in the following points:

"The head is broader in *A. eydouxii;* the ventrals and the anal are without spot; the anal is not emarginate in its median part, but cut squarely. The principal difference is in the shield which precedes the dorsal. In the species of Steindachner this shield is narrow, in the other it is as long as broad, the lateral edges being rounded. On the other hand the shield which precedes this is more narrow than in *A. pinnimaculatus*.

"D. I, 7; A. 30; P. 1, 14.

"Length of head 4¾ in total length; predorsal shield broad, rounded on the edges, granulated and grooved. Teeth of the palate forming a

*In the Proc. U. S. Nat. Mus. 1882, 608, we have retained for this species the name of *Platyglossus radiatus*. This is an error. The *Sparus radiatus* of the twelfth edition of the Systema Naturæ, p. 472, received through Dr. Garden, from Charleston, is this fish, as stated by us. In the tenth edition, p. 288, there is, however, a *Labrus radiatus* based on Catesby's figure of the "Pudding wife," which is *Platyglossus cyanostigma*. The latter species must therefore be called *Platyglossus radiatus*, and the oldest tenable name of the other seems to be *bivittatus*.

†A specimen of a plain crimson color, without blue spots or markings.

transverse band subinterrupted at the middle. Four barbels, the maxillary barbel reaching to the middle of the pectoral spine. Dorsal spine grooved, granulated on its anterior edge; pectorals much prolonged, the filament reaching to the end of the anal. Body and fins of uniform color."

In a paper in the Proc. Ac. Nat. Sci. Phila., 1883, 291, I have stated my opinion that the original type of *Batrachus porosissimus* Cuv. & Val., xii, 501, would prove to be identical with *Porichthys plectrodon*, as all Atlantic specimens of *Porichthys* thus far seen by us belong to the latter species. That this view is correct is shown by the following paragraph from the letter of Dr. Sauvage:

"The *Batrachus porosissimus* (Brazil, Delalande), the type of which I have before me, has a strong canine on each side of the vomer; on the palatines are seen at first a strong tooth, then some small teeth, and finally a strong curved tooth.

"There is also a strong tooth on the vomer in *Porichthys porosus* (Chili, Gay), but the band of palatine teeth is longer, and in consequence these teeth are more numerous."

Three species of *Porichthys* are therefore known at present, as follows:

1. **Porichthys porosissimus** (Cuv. & Val.).

Batrachus porosissimus C. & V., xii, 501.
Porichthys porosissimus Gthr., iii, 176 (in part).
Porichthys plectrodon Jor. & Gilb., Proc. U. S. Nat. Mus., 1882, 291.

HABITAT.—West Indian fauna; Charleston; Pensacola; Galveston; Brazil; Surinam.

2. **Porichthys margaritatus** (Richardson).

Batrachus margaritatus Rich., Voy. Sulphur, Fishes, p. 67.
Porichthys notatus Girard, Proc. Ac. Nat. Sci. Phila., 1854, 141.
Porichthys porosissimus Günther, iii, 176 (in part; specimen from Vancouver Island).
Porichthys margaritatus Jor. & Gilb., Syn. Fish. N. A., 1883, 958.

HABITAT.—Californian fauna; Lower Californian fauna; Van Couver Island; Puget Sound; California; Gulf of California; Gulf of Fonseca (Richardson); Panama.

3. **Porichthys porosus** (Cuv. & Val.).

Batrachus porosus Cuv. & Val., xii, 506.
Porichthys porosus Günther, iii, 177.

HABITAT.—Chilian fauna, coast of Chili.

INDIANA UNIVERSITY, *February* 20, 1884.

NOTES ON SOME FLORIDA FISHES.

By G. BROWN GOODE and TARLETON H. BEAN.

At various times, in the publications of the United States National Museum and elsewhere, the validity of some species of Florida fishes described by us has been called in question by Professors Jordan and Gilbert, and several of our names have been referred to the synonymy of older species without adequate show of proof. In a preceding paper Professor Jordan reiterates some of these statements, and we now feel called upon to give our reasons for adhering to the names proposed by us. The fishes immediately concerning us at present are the following: *Lutjanus stearnsii*, *Lutjanus blackfordii*, and *Caulolatilus microps*. In addition to these three, we have studied *Sparus pagrus* and *Xyrichthys "lineatus,"* upon which we have some remarks to make.

1. Lutjanus stearnsii Goode & Bean.

Lutjanus stearnsii GOODE & BEAN, Proc. U. S. Nat. Mus., I, 1878, p. 179; JORDAN & GILBERT, Syn. Fish., N. A., 1883, p. 549.

Lutjanus caballerote POEY (specimen in U. S. National Museum, number 9862).

?? *Anthias caballerote* SCHNEIDER, Bloch Syst. Ichth., 1801, p. 310.

We have been aware for some time that the species of *Lutjanus* called *stearnsii* by us occurs in the West Indies, and upon comparison of our type with an example of *caballerote*, as determined by Poey, we find that the two are identical. We cannot understand, however, the apparent ease with which Schneider's description has been interpreted; to us it is completely useless for the purposes of identification. We prefer to use the name *stearnsii* for the present, and until one of the older names, *cynodon* or *griseus*, is demonstrated as applying to our species.

The example received from Professor Poey, measurements of which are given farther on, exhibits the following among other characters:

There are only eight developed gill-rakers on the first arch, one above and seven below the angle; the longest is one-half as long as the eye. There are seven rows of scales on the cheeks. The single patch of lingual teeth is twice as long as it is broad. The vomerines are in a triangular patch on the head, with a long, narrow backward extension. The palatines are in a broad band. The scales extend upon the membranes of the dorsal, anal, and caudal fins for about one-half their height, or rather more on the caudal. There are two very strong canines in the upper jaw, and two much smaller ones between these and the symphysis. The mandible is without enlarged canines.

The edge of the spinous dorsal membrane is black. The caudal has a narrow black margin. The included portion of the maxilla is brown. The scales of the body below the lateral line have median golden stripes, as in some species of *Mugil*.

Measurements.

Species, LUTJANUS CABALLEROTE Poey.

Current number of specimen	9862.	
Locality	Cuba.	
	Millimeters.	100ths of length.
Extreme length without caudal	242	.....
Length to end of middle caudal rays	293	.....
Body:		
Greatest height	82	34
Height at ventrals	82	34
Least height of tail	31	12.4
Head:		
Greatest length	90	37
Length of longest gill-raker	9	.....
Width of interorbital area	19	8
Length of snout	27	11
Length of operculum	27	11
Length of maxillary	31	12.4
Length of upper jaw	36	15
Length of mandible	43	17.8
Distance from snout to orbit	32	13
Diameter of orbit	20	8
Dorsal (*spinous*):		
Distance from snout	100	41.2
Length of base	69	28.5
Length of first spine	8	.....
Length of second spine	19	.....
Length of fourth spine (longest)	31	12.4
Length of last spine	20	
Dorsal (*soft*):		
Length of base	52	21.5
Length of first ray	23+	.....
Length of longest ray	32	13
Length of last ray	18	7.4
Anal:		
Distance from snout	173	71.5
Length of base	35	14.5
Length of first spine	9	.....
Length of second spine	22	9
Length of third spine	21	8.7
Length of first ray	33	13
Length of longest ray (second)	37	15
Length of last ray	21	8.7
Caudal:		
Length of middle rays	51	21
Length of external rays	57	23.5
Pectoral:		
Distance from snout	84	34.7
Length	61	25
Ventral:		
Distance from snout	94	39
Length	48	20
Branchiostegals	VII	.....
Dorsal	X, 14	.....
Anal	III, 8	.....
Pectoral	i, 16	.....
Ventral	I, 5	.....
Number of scales in lateral line	47	.....
Number of transverse rows above lateral line	7	.....
Number of transverse rows below lateral line	14	.....

2. Lutjanus blackfordii Goode & Bean.

Lutjanus blackfordii GOODE & BEAN, Proc. U. S. Nat. Mus., I, 1878, p. 176, (full description of adult); II, 1879, pp. 137, 138 (characters and measurements of young); GOODE, Game Fishes N. A., 1878, p. 16, with colored plate. JORDAN & GILBERT, Syn. Fish. N. A., 1883, p. 549.

Lutjanus campeachianus JORDAN & GILBERT, l. c., p. 971 (not *Mesoprion campeachanus* Poey, Mem. Cub., II, 1860, p. 149); JORDAN, Proc. U. S. Nat. Mus., VII, 1884, p. 35.

When we described the Red Snapper as a new species under the name *Lutjanus blackfordii* we were in possession of all the information concern-

ing Poey's *campeachianus* that was then available, and no one has, since that time, added anything but conjecture upon the relation of the Gulf form to the original of Poey's description. Indeed it is by no means certain that the type of that description is in existence. There is some ground for the belief that the specimen now purporting to be the basis of Poey's account is a later, erroneous identification of the Red Snapper. Any one who will compare our measurements of *Lutjanus blackfordii* on page 179 of Vol. I and 138 of Vol. II of the Proceedings above referred to with the description of *L. campeachianus* will observe the important discrepancies between our fish and that of Poey.

It will be found that the eye of *L. campeachianus* is very much larger, and that the scales above the lateral line are much more numerous than in *L. blackfordii*. We are not concerned with Poey's recent interpretation of the Red Snapper, and we do not consider that this should be allowed to enter into the the discussion. In *Lutjanus blackfordii* we have a species fully described and accurately figured. It is quite as impossible to reconcile our species with the description of *L. campeachianus* now as it was six years ago, and we cannot see the supposed necessity of uniting the two on the basis of our present knowledge.

3. **Caulolatilus microps** Goode & Bean.

The following notes were obtained from an example of *C. chrysops* in the British Museum:

The length of the longest gill-raker is 4½ millimeters. The opercular spine is short, but sharp. The preoperculum is finely denticulated on its posterior margin. The black axillary spot is not quite so long as the pupil. The twenty-first ray of the dorsal is somewhat produced, as well as the twentieth anal ray; and these rays are only once divided and not twice, like all the others. If the scales be counted obliquely upward and forward from the anal origin to the lateral line, we shall find 31 or 32 rows; if counted upward and backward, 28.

The most important differences between *C. microps* and *C. chrysops* will be observed in (1) the length of the snout, (2) the length of the dorsal spines and rays, (3) the length of the longest anal rays, (4) the length of the paired fins, and (5) the number of scales in the lateral line. We cannot attribute these discrepancies to a difference in age, and we believe that nothing is to be gained by attempting to estimate the relations of the species by an examination of the literature alone. It will be best to consider *microps* as an established species until its claim to distinctness can be more successfully controverted.

An examination of the table of measurements which follows will show the relations of the West Indian and Gulf forms under discussion. We believe that three clearly marked species are indicated.

Measurements of species of Caulolatilus.

	C. microps, 20971. Pensacola, Fla.		*C. chrysops* (Brit.Mus.). Barbadoes.		*C. cyanops*, 4750. Cuba.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Length to origin of middle caudal rays	620	.....	290	.....	330	.....
Body:						
Greatest height	.....	28	.....	28.6	.....	24.3
Greatest width	.....	14.5	.....	.....	.....	12
Height at ventrals	.....	28	.....	28	.....	24.3
Least height of tail	.....	8	.....	8	.....	7
Length of caudal peduncle	.....	10	.....	.....	.....	11
Head:						
Greatest length	.....	28	.....	28.6	.....	28
Distance from snout to nape	.....	.....	.....	13.4	.....	15
Greatest width	.....	14	.....	12.4	.....	13.5
Width of interorbital area	.....	7	.....	8.6	.....	8.5
Length of snout	.....	14	.....	8	.....	10
Length of maxillary	.....	12.5	.....	*10.7	.....	10.3
Length of mandible	.....	13	.....	12.4	.....	12.5
Distance from snout to center of orbit	.....	14.7	.....	.....	.....	11
Diameter of orbit	.....	4.8	.....	6.9	.....	7.5
Dorsal (*spinous*):						
Distance from snout	.....	34	.....	32.4	.....	32.5
Length of base	.....	12.5	.....	13.4	.....	13
Length of first spine	.....	3.5	.....	5	.....	5
Length of second spine	.....	5.5	.....	6.9	.....	6
Length of last spine	.....	7.5	.....	10	.....	9.5
Dorsal (*soft*):						
Length of base	.....	44.5	.....	48.6	.....	46
Length of first ray	.....	7	.....	11	.....	10.5
Length of longest ray	.....	8.5	.....	16	.....	13
Length of last ray	.....	4.5	.....	5	.....	5
Anal:						
Distance from snout	.....	55	.....	54.5	.....	51.5
Length of base	.....	35.5	.....	39.7	.....	37.5
Length of first spine	.....	3	.....	.....	.....	3
Length of first ray	.....	6	.....	7.6	.....	7.5
Length of longest ray	.....	8.5	.....	12.4	.....	12
Length of last ray	.....	4.5	.....	4.8	.....	5
Caudal:						
Length of middle rays	.....	11.5	.....	14.8	.....	11
Length of external rays	.....	16	.....	22.7	.....	17.5
Pectoral:						
Distance from snout	.....	30.5	.....	28	.....	27.5
Length	.....	23	.....	27.6	.....	26
Ventral:						
Distance from snout	.....	34.5	.....	32	.....	31
Length	.....	14	.....	17	.....	16
Branchiostegals	VI	.....	.....	.....	VI	.....
Dorsal	VII, 25	.....	VII, 23	.....	VII, 24	.....
Anal	I, 23	.....	I, 22	.....	I, 22	.....
Pectoral	i, 16	.....	.....	.....	i, 15	.....
Ventral	I, 5	.....	I, 5	.....	I, 5	.....
Number of scales in lateral line	Ab't 120	.....	100	.....	108	.....
Number of transverse rows above lateral line	13	.....	11	.....	10	.....
Number of transverse rows below lateral line	35	.....	32	.....	25	.....
Number of gill-rakers	.....	.....	19	.....	.....	.....

* This means the upper jaw; the maxilla alone is 9.6.

4. Xyrichthys psittacus (L.) Goode & Bean.

Coryphæna psittacus LINNÉ, Syst. Nat., ed. xii, 1766, p. 448.
Coryphæna lineata GMELIN, Syst. Nat.

The type of *Coryphæna psittacus*, labeled by Linné, and marked No. 20 (evidently the No. 20 referred to on page 313, Correspondence with Linné by Garden, as a fish of surpassing beauty), is the species which we have for some time known as *Xyrichthys lineatus*. Linné's descrip-

tion agrees fully with this example except in the count of the dorsal, which, for some unknown reason, is $\frac{9}{11}$ instead of $\frac{10}{11}$, as Linné would have made it. All the other fin-rays are correctly given.

The length of the type to the caudal base is 151 millimeters, and the characters are as follows: D. IX, 12; A. III, 12, the last of the dorsal and anal rays double; V. 6; P. 11; C. 14; scales 2 above lateral line; tubes about 24 in all.

The lateral line is interrupted under the 10th ray of the dorsal; the accessory line begins on the median line, under the end of the upper lateral line, and consists of five short tubes.

The height is one-third of the length to caudal base; the head one-fourth. The eye is about equal in length to the upper jaw, and is placed at the top of the head.

Cryptopsa psittacus has been supposed to be a *Pseudoscarus* (Günther, Cat. Fish. Brit. Mus., IV, 225), but we must now find another name for the species to which the Linnæan name has been wrongly applied.

5. **Sparus pagrus** Linné.

Pagrus argenteus GOODE & BEAN, Proc. U. S. Nat. Mus., II, 1879, p. 133.
Sparus pagrus JORDAN & GILBERT, Syn. Fish. N. A., 1883, p. 556.

We have again examined the Gulf Porgee, and compared it directly with a specimen of about equal size which was recently obtained from Leghorn. Although there is some difference in the general appearance of the two forms, we cannot distinguish them as separate species. The life colors we have not observed, but so far as the condition of the two in spirits is concerned we believe that the subjoined table of measurements, together with the remarks now to follow, will substantiate our original statement of the identity of the two.

The example from Leghorn has 17 gill-rakers on the first arch, 9 of which are below the angle; it has 7 rows of scales on the cheeks; 4 canines in the front of the upper jaw; 6 in the front of the lower jaw; 2 rows of large molars in the upper jaw, and a short, imperfect inner row, consisting of a few small molars developed only anteriorly; 2 rows of molars in the lower jaw, with an accessory inner row of minute ones similar to those in the upper jaw.

The Pensacola specimen also has 17 gill-rakers on the first arch, 8 to 9 of them below the angle.

It seems almost unnecessary to add more than to call attention to the close correspondence in the measurements of the two individuals which we have recently compared.

Measurements.

Species, SPARUS PAGRUS Linné.

	(34) Leghorn, Italy.	21339. Pensacola, Fla.
	Millimeters.	Millimeters.
Length to end of middle caudal rays	382	390
Length to origin of middle caudle rays	340	346
Body:		
Greatest height	133	133
Greatest width	53	56
Height at ventrals	133	133
Least height of tail	38	34
Length of caudal peduncle	50	52
Head:		
Greatest length	108	112
Distance from snout to nape	53	59
Greatest width	54	57
Height of preorbital	33	35
Width of interorbital area	34	32
Length of snout	36	43
Length of operculum	30	30
Length of upper jaw	45	45
Length of mandible	45	45
Distance from snout to orbit	50	54
Diameter of eye	26	26
Dorsal (*spinous*):		
Distance from snout	146	145
Length of base	115	109
Length of longest spine (4th)	48	43+
Length of first spine	15	20
Length of second spine	37	26+
Length of third spine	44	37+
Dorsal (*soft*):		
Length of base	66	64
Length of first ray	34	29
Length of longest ray	40	39
Length of last ray	36	39
Anal:		
Distance from snout	230	226
Length of base	60	63
Length of first spine	15	12
Length of second spine	31	26
Length of third spine	31+	27
Length of first ray	38	30+
Length of longest ray	38	35
Length of last ray	31	35
Caudal:		
Length of middle rays	42	44
Length of external rays	88	85
Pectoral:		
Distance from snout	110	115
Length	126	122
Ventral:		
Distance from snout	126	127
Length	74	72
Length of appendage	23	24
Dorsal	XII, 10	XII, 10
Anal	III, 7	III, 8
Pectoral	[illegible]	[illegible]
Ventral	I, 5	I, 5
Number of scales in lateral line	56	56
Number of transverse rows above lateral line	7	7
Number of transverse rows below lateral line	15	15
Number of rows on cheeks	7	7
Number of gill-rakers	17	17

DESCRIPTION OF A NEW SPECIES OF WHITEFISH (*Coregonus nelsonii*), FROM ALASKA.

BY TARLETON H. BEAN,

Curator of the Department of Fishes in the United States National Museum.

Coregonus nelsonii Bean. Hump-back whitefish.

This species is known from Alaska only, occurring from the Bristol Bay region northward to the extremity of the Territory.

This whitefish, which appears to be still undescribed, has long been known from Alaska, but it has been confounded with a Siberian species, *C. syrok*, from which it is really very different. The Russian name of the species is *Korabati*; the Tinneh tribes of the Yukon call it "*Kolokŭh*." Mr. Dall, in the report of the Commissioner of Agriculture for 1870, page 386, speaks of it as a common species, characterized by the strongly arched back and broad tail. He says it is rather bony and inferior in flavor, and that it is generally used for dog-feed, except in times of scarcity.

This species is related to *C. clupeiformis* and *C. labradoricus*. From *clupeiformis* it may readily be distinguished by its greatly arched and much compressed back. The body is oblong and compressed; the head is one-fifth as long as the fish without the caudal; the maxilla extends to the front margin of the eye, and is about one fourth as long as the head; the gill-rakers are only moderately long, the longest a little more than one-half length of eye, and their number is about 26. The greatest height of the body is a little more than one-fourth of the total length in the typical example, which is about 14½ inches long to caudal base. The adipose fin is large and scaled for nearly half its height. The ventrals are a little nearer the tip of the snout than the root of the caudal; they are about as long as the head without the snout. D. 12; A. 12; scales 10—88—10. The type of the species is No. 29903, taken at Nulato, Alaska, by Mr. E. W. Nelson, to whom the species is dedicated in recognition of his important zoological researches in that Territory.

ON THE LITERATURE AND SYSTEMATIC RELATIONS OF THE SACCOPHARYNGOID FISHES.

By THEODORE GILL and JOHN A. RYDER.

About sixty years ago a most remarkable fish was first introduced into scientific literature under the generic name *Saccopharynx*. Other examples have been found in the meanwhile, and yet until the present the form has had no established place in the system. Notwithstanding the alleged existence of two specimens in one of the richest ichthyological collections extant, under the custody of one who has professed to give the most complete system of fishes, the type has been involved in

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much uncertainty. The recent discovery of an even more remarkable form in the deep seas of the North Atlantic has directed our attention to the older known species, and by reason of the light reflected by the newly-discovered one, we are enabled to interpret much that was ambiguous and inexplicable in the descriptions of the old ichthyologists. We here give an historical sketch of *Saccopharynx* and the fishes that have been referred to that genus.

I.

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II.

HISTORY.

In 1824, Dr. S. L. Mitchill, in the Annals of the Lyceum of Natural History of New York (v. 1, pp. 82-86), contributed a "description of an extraordinary fish resembling the Stylephorus of Shaw." The fish in question was presented to Dr. Mitchill by Capt. Hector Coffin, and "was taken during a voyage from Londonderry to New York, in latitude 52

N. and longitude 30 W. It was discovered afloat about twenty yards from the vessel. A boat was hoisted out for the purpose of raising it. The creature was raised from the water without any resistance, and died in fifteen minutes after being taken on board."

"When first seen, the belly was distended, as if blown up to the size of a quart decanter, or the crown of a hat. The stomach contained a fish ten inches long, which, from its sound state, appeared to have been recently swallowed. That fish was not preserved.

"The length was six feet; of which fourteen inches belonged to the body, or the space between the extremity of the upper lip beneath to the vent. The tail was flagelliform, or like the lash of a whip, and gradually tapered away in the course of fifty-eight inches to a point. Toward the end it was flexible enough to be tied into knots, after the manner of a string or a cord." (P. 84.)

"The distance from the mouth to the vent was fourteen inches. All the rest of the length, amounting to fifty-eight inches, tapered away gradually from an inch in depth almost to a point." (P. 84.)

"The skin was smooth and scaleless, and susceptible of being easily moved and pinched up, like that of some species of Lophius." (P. 84.)

"*Filiform processes*, or excrescences, about an inch in length, *depended on each side* of the whitish stripe [along the side of the fish] all the way *from the head down to the back of the tail*. The space between them is nearly an inch, so that they probably amounted to fifty pairs. These cirrhi or threads have no expansion or enlargement at their extremities." (P. 85.)

"*The head was smaller than is usual in fish*. It would seem that its principal use was to give origin and insertion to the bones and muscles of the jaws. At its foremost point is a small knob or projection forward of the eyes; and from it proceeded a sort of fraenum sustaining the upper lip. From this inconsiderable head proceeded *the vertebral column*, which, *in its progress to the tail*, gradually tapered away and *seemed to lose its bones and joints, and to be converted into a sort of tough and grisly appendage*." (Pp. 83, 84.)

"The eyes were situated about half an inch from the point of the upper jaw, one on each side, and looking forward. They were small, and did not exceed in diameter the sixteenth of an inch." (P. 83.)

"The mouth had an enormous gape; and the throat, for the space of six inches, was but a membranous bag. It was capacious enough to receive my hand without difficulty. The internal surface was black. There was *no appearance of a tongue*.

"From the upper part of the mouth, or the spot where the upper *maxillary bones* unite, to the angle of the jaw, was *three inches*, and from that angle to the tip of the lower jaw, three inches.

"*The symphysis of the chin* had a very flexible joint, that *was capable of opening or expanding from a most acute angle to a right line*, or as nearly so as the curvature of the bones permitted. This construction, with a

corresponding laxity of the jaws, gave the mouth an extraordinary power of expansion. *Yet, when the angles of the jaws are approximated, and the bones of the lower jaw brought to their parallelism, the mouth closes with exactness*, and in that state gives no indication of the size to which it spreads when open.

"*The lower jaw was toothless;* but the upper jaw for about an inch and a half was furnished with a row of teeth, bony and hooked." (P. 83.)

"There were two gill openings, one on each side of the neck below, resembling slits, about an inch and a half long. The *gills* themselves are situated within the duplicatures of the openings *in three bundles or divisions, suspended by membranes and skin.*" (P. 84.)

"*The dorsal fin begins about* 11 *inches from the tip* of the upper jaw, *and reaches*, like a fillet or a narrow riband, quite *to the tail*, and at its extremity joined the anal.

"*The anal fin* commenced just behind the vent, and was *continued also quite to the tail*, and there joined the dorsal.

"*The caudal fin* was so faint or *indistinct* that I have hardly thought it worthy of notice. I ought to remark that several *hair-like rays may be distinguished.* The rays of *these were very numerous*, but it was impossible to count them.

"*Thus the dorsal and anal fins are united with each other or are connected with the caudal.*

"The pectoral fins are situated immediately behind the gill openings. They are very small and feeble, of a squarish shape, and from one-half to one-quarter of an inch long. They were of a fleshy consistence, and contained about thirty slender rays." (Pp. 84, 85.)

"*From the head a whitish line* extended *on each side of the back*, as far as its bony constitution could be traced. Two similar stripes, *one on each side*, proceed *from the vent* backward to the tail, but they are less distinct, and disappeared sooner. Between the former is situated the dorsal fin; between the latter, the anal fin." (P. 84.)

"The specimen was a female, and the colour a dusky brown, resembling that of a dark eel." (P. 82.)

"The roes were very distinct, the ovaries being large and full of eggs." (P. 82.)

The fish thus described was considered to be identical with the Stylephorus of Shaw, now found to be a representative of the family *Trachypteridæ*. Dr. Mitchill observed that "the points of resemblance between this animal and the *Stylephorus* described by Shaw may be easily gathered even from his bad description and worse figure. They are both furnished with the same curiously organized mouth, the same fins and elongated caudal process. The lateral line described above corresponds with the "double fibre" of Shaw, and they are both scaleless. In the *Stylephorus* the dorsal is described as not being continuous. He says, however, "I am not without my doubts whether it might not, in the living animal, have run quite to the tail, and whether the specimen might not have received injury in that part."

"The colour of Shaw's fish is described as silvery, but those who are acquainted with the fugacious nature of metallic colours in this class of animals are aware that nothing positive can be deduced from this accidental circumstance. The fact of their being captured in different latitudes, and the difference in their size, is of little importance.

"The eyes of the *Stylephorus* are described as being large and pedunculated; in the animal noticed above they are small and sessile. Shaw examines carefully to find marks of a reticulated structure, but without success. The circumstance of their standing on peduncles or foot-stalks is so much at variance with what occurs in other animals that I should hesitate little in declaring their unusual form to have been the result of accident or disease.

"As the generic name proposed by Shaw is probably derived from an accidental character, I venture to substitute for it the name of *Saccopharynx*, in allusion to the pouch-like form of its throat." (Pp. 85, 86.)

It will thus be observed that Mitchill manifests little or no doubt as to the identity of his fish with the *Stylephorus* of Shaw, and that the name of *Saccopharynx* proposed by him was given simply as a substitute, and on account of the impropriety of Shaw's name. It is quite evident, however, that there is no relation between the two forms, and that they belong even to widely distinct orders.

It might then be questioned whether the name *Saccopharynx* should be admitted for the new genus, and whether it should not rather be considered as a synonym of *Stylephorus;* but this doubt is at once dissipated when we recur to the generic diagnosis of Mitchill, where it appears that his description was based upon an entirely different form, and is not interchangeable with one framed for Shaw's species. The diagnosis of Mitchill is as follows:

"Genus. SACCOPHARYNX.

"Jaws capable of great dilatation.

"Throat wide like a bag.

"Tail flagelliform, tapering away to a point, and beset with many pairs of cirrhi.

"Dorsal, caudal, and anal fins united."

No specific name was given by Dr. Mitchill to his fish, but he would probably have called it *Saccopharynx chordatus.*

In 1827, Dr. J. Harwood, "professor of natural history in the Royal Institution of Great Britain," communicated to the Royal Society, in whose "Philosophical Transactions" it was published (for the year 1827, pp. 49–57, pl. 7) a memoir "on a newly discovered genus of serpentiform fishes." This memoir was devoted to an account of "a newly discovered, and a very extraordinary marine animal, which was obtained in the autumn of 1826.

"Whilst Captain Sawyer, of the ship Harmony, of Hull, was in pursuit of the bottle-nose porpoise, in latitude 62° north, by about 57° west, he observed a body floating on the surface of the water, which was at first mistaken by himself and his seamen for an inflated seal's skin, such as the Esquimaux employ in the destruction of large aquatic animals, by attaching a harpoon by which they are speared, and thus tiring them out by its floating property. On a nearer approach, however, the object which had excited their attention proved to be a marine animal. The "creature" was preserved by Captain Sawyer, who "obligingly afforded" to Dr. Harwood "an opportunity of examining it."

"Its capture was occasioned by its being, when first observed, almost worn out by unavailing efforts to gorge a fish of about seven inches in circumference, with which it appeared to have been long contending, as it exhibited very feeble signs of life. Its organs of motion being extremely small and its body greatly elongated, this creature would, on a cursory view, be by all considered as an extraordinary kind of sea serpent," in the opinion of Dr. Harwood. (P. 50.)

"The *total length* of the specimen taken is 4 feet 6 inches. The enlarged and extremely elastic pharynx communicates with the enormous sac or air vessel, which extends in length from the extremity of the snout about 20 inches. The great delicacy of the parietes of this sac, and its apparent liability to rupture from the action of the spirit, prevented my inflating it to its full extent, but when partially filled with air, it measured about 9 inches in circumference below its union with the tail, and its greatest diameter, including the slender body to which it pertained, was 4 inches. At about one inch below the last point of its attachment with the body, the rectum was observed to perforate the sac, the tenuity of which rendered the course of that intestine, as indeed that of all the digestive organs, readily traced." (Pp. 52, 53.)

"The skin all over the body of the Ophiognathus is particularly soft and slimy, yet it has a slightly granulated appearance." (P. 55.)

"The body exhibits no apparent lateral line." (P. 56.) No lateral filaments were observed.

"Perhaps the most curious structure which the creature presents to our notice is connected with the head and jaws. The almost entire *absence of a tongue*, might perhaps prove one of its characteristic distinctions, were we as yet sufficiently acquainted with the condition of this organ in those nearest allied to it. The *teeth* are disposed *in a single row above and below:* above, they exist only along the margins of the intermaxillary bones; *below, they extend almost the whole length of the maxilla:* but the ossa palati are entirely destitute of teeth. Lastly, the jaw bones are so long, *and their articulation is such*, that their capability of expansion exceeds what I have seen in any other animal, the rattlesnake not excepted; and as in snakes, when fully distended, the edges of the jaws describe a large circle, and then appear but as the hemming of an ample sack, the pharynx, which usually occupies so

small a space, being an equal participant in this extensile property. When the *jaws* were gently opened, they measured 2½ inches across, and 3½ inches from the front teeth above to those below; but while they possess this capability of distension, their *contractile power* is no less *remarkable*, as may be observed in Plate VII, Fig. 1, which represents the usual appearance. Fig. 2 exhibits the jaws and pharynx more depressed and expanded. Fig. 3 represents an anterior view of the same." (P. 56.)

"The spiracula are of large size, of an irregular oval form, and are *unprovided with* externally perceptible *branchiostegous rays;* their edges *partially conceal* on each side *three branchiæ*. When the sac is contracted, these apertures are placed almost under the body, as in the Sphagebranchus, having a narrow commissure between them; they are placed at about 5½ inches from the snout." (P. 55.)

"All the fins of the Ophiognathus are extremely small." (P. 55.)

"The *dorsal fin*, which like the rest is very narrow, and provided *with simple rays*, *commences at about* 18 *inches from the snout*, *and terminates* insensibly upon that slender, tape-like filament, into which *the tail* becomes converted, and which *is continued* 20½ *inches* in length *beyond* the posterior extremity of *the dorsal fin*. About this part of the dorsal fin a few other minute filaments take their growth from it." (P. 55.)

"The *anal fin* commences at the posterior union of the sac with the body, and *ends at about* 14 *inches from the extremity of the caudal filament*." (P. 55.)

"In the formation of the *pectorals* there is a peculiarity not mentioned, I believe, in other apodal genera, they being principally *composed of an adipose disk*, which is *terminated* and nearly surrounded *by a narrow radiated membrane*, instead of this latter taking its origin immediately from the body." (P. 55.)

Dr. Harwood was unacquainted with the description by Dr. Mitchill of *Saccopharynx*, and compared his fish only with the generally recognized genera of the apodal fishes. He remarked that "although, in the present day, the term 'sea-serpent' would be ill applied to any animal which breathes by means of branchiæ, yet among such creatures, excluding the Hydrus and Hydrophis, and other true water snakes which inhabit the tropical seas, I doubt if the subject of this communication be not at least as well entitled to the appellation as any hitherto described. From the several genera of animals however nearest allied to it, it offers points of disagreement so important, as to entitle it to a distinct place in classification, and especially from the formation of the jaws, which, with the exception of the apparent want of serpentine interarticular bones, are truly analogous to those of snakes; and, secondly, from the possession of an enormous elastic sac, which is seemingly a receptacle for air only. The first of these latter characters appearing to be the one of all the least liable to vary, I would suggest the term Ophiognathus as applicable to the genus; its characters are as follows:

"OPHIOGNATHUS. Corpus nudum, lubricum, colubriforme, compressum, sacco amplo abdominali.

"Caput anticè depressum, maxillâ superiore (paulo) longiore.

"Dentes, in maxilla inferiore, et ossibus intermaxillaribus, subulati, retroflexi.

"Maxillae elongatae, patulae, dilatabiles, (serpentium instar)

"Lingua vix conspicua.

"Spiracula ante et sub pinnas pectorales, magna.

"Pinnae pectorales, dorsales, analesque radiis mollibus; ventrales nullae.

"Oculi mimimi, prope extremitatem maxillae superioris positi.

"Cauda elongata, in filamentum apterum producta." (Pp. 51, 52.)

In 1829, Cuvier, in the second edition of his Règne Animal, adopted the genus *Saccopharynx* of Mitchill, referred it to the "Malacoptérygiens Apodes," gave a new diagnosis, and placed it after the true Apodal fishes or Eels, and before *Gymnotus*, &c. He called attention to the discrepancies as to the dentition between the animals of Mitchill and Harwood, and suggested that they may prove to be distinct species. He noticed the fish of Mitchill under the name of *Saccopharynx flagellum*, but this name first appears in his work, Mitchill having given no specific name, and doubtless he would have called it *Saccopharynx chordatus*.

The text of Cuvier is as follows:

"C'est à la suite de ce grand genre des murènes qu'il nous paraît convenable de placer un poisson nouvellement découvert, et l'un des plus singuliers que l'on connaisse.

"LE SACCOPHARYNX de Mitchill;
"OPHIOGNATHUS de Harwood.

"Dont le tronc, susceptible de se renfler comme un gros tube, se termine par une queue très grêle et très longue, entourée d'une dorsale et d'une anale très basse, qui s'unissent à sa pointe. Sa bouche armée de dents aiguës, s'ouvre jusque loin en arrière des yeux, qui sont tout près de la pointe très courte du museau. Ses ouïes s'ouvrent par un trou au-dessous des pectorales qui sont très petites.

"Ce poisson devient très grand, et paraît vorace. On n'en a vu que dans l'Océan atlantique, où ils flottaient à la surface, au moyen de la dilatation de leur gorge."*

In 1836, Dr. (afterwards Sir) John Richardson, in his "Fauna Boreali-Americana" (v. 3, p. 271), incorporated the Mitchillian fish with the Harwoodian and under the name *Saccopharynx ampullaceus*, and admitted it as a species of the North American fauna.

* Le *Saccopharynx flagellum*, de Mitchill, était long de six pieds, l'*Ophiognathus ampullaceus* de Harwood, Trans. phil., de 1827, en avait quatre et demi. Le premier ne paraissant pas avoir eu de dents à la mâchoire inférieure, il se pourrait que ces deux poissons, bien que pris dans les mêmes parages, ne fussent pas identiques par l'espèce, mais ils appartiennent manifestement au même genre.

In 1845, in the 24th volume of the "Encyclopædia Metropolitana," an article, "Saccopharynx," appeared, in which the genus was redefined and two species recognized and renamed, the fish of Mitchill being called *S. Mitchilli*, and that of Harwood *S. Harwoodi*, especial attention being called to the fact that "the intermaxillary bones and the branches of the lower jaw were in Dr. Harwood's specimen furnished with fine sharp teeth curved backwards, but in Dr. Mitchill's the lower jaw was toothless." The author of the article is not specifically designated, but as indicated in the table of "Contents to Vol. XXIV," the "Zoology" was prepared by "J. T. Stephens, esq., F. L. S., F. Z. S.; and J. F. South, esq., F. L. S., assistant surgeon, St. Thomas's Hospital."

In 1846, Dr. D. H. Storer, in his "Synopsis of the Fishes of North America" (p. 237(, incorporated the Mitchillian fish under the name "*Saccopharynx chordatus* Mitchill," among the fishes of North America, retaining it in the family "Anguillidæ." The genera admitted in that family by Dr. Storer were (1) *Anguilla*, (2) *Conger*, (3) *Muræna*, (4) *Ophidium*, (5) *Fierasfer*, (6) *Saccopharynx*, and (7) *Ammodytes*.

In 1856, Prof. A. M. C. Duméril, in his "Ichthyologie Analytique," (p. 217), included the genus *Saccopharynx* in his family of "Pantopteres Diapodes," an unnatural assemblage of the genera (1) *Alabes*, (2) *Saccopharynx*, (3) *Anguilla*, (4) *Conger*, (5) *Ophidium*, (6) *Fierasfer*, (6) *Mastacemble*, and (7) *Ammodytes*. A single species ("une seule espèce, très-grande, péchée dans l'Océan atlantique") was recognized.

In 1862, Mr. James Yate Johnson communicated "notes on rare and little-known fishes taken at Madeira," in which an example of the same type is described under the name *Saccopharynx ampullaceus*. The specimen obtained by Mr. Johnson "was taken in the month of March, off the coast of Madeira, but under what circumstances [Mr. Johnson] could not learn. The man from whom [he] obtained it stated that he had a fish with two heads, two mouths, four eyes, and a tail growing out of the middle of the back, which had astonished the whole market, and the fishermen one and all declared they had never met with anything like it before. At first sight it really did appear to be the monster described; but a short examination brought to light the fact that one fish had been swallowed by another, and that the features of the former were seen through the thin extensible skin of the latter. On extracting the fish that had been swallowed, it proved to be a Gadoid [*Halargyreus Johnsonii*], and to have a diameter several times exceeding that of its enemy whose stomach it had distended to an unnatural and painful degree" (p. 277).

"The Madeiran fish is 32 inches in length. It has a thin, soft, scaleless skin, which is jet black. From its narrow, elongated form, and from the absence of ventral fins, it would be referred at the first glance to the Eels; but from that tribe it is distinctly separated by the structure

of its singular jaws. The upper jaw is apparently composed of the maxillary or premaxillary—bones which are invariably wanting in the tribe of true Eels. The bones of both jaws are slender and curved; those of the *under jaw* meet at an acute angle in front, and they are armed *with a single row of small, sharp, delicate teeth*, similar to those of the upper jaw, but rather more numerous. There are no teeth on the palatine bones or elsewhere in the mouth.

"The gape is of an enormous extent; and the animal had the power of throwing down the lower jaw until it was almost in a line with the upper, the two being subequal and 2⅕ inches in length. There is *no tongue* in the mouth, *nor are there any branchiostegal rays.* A conical snout projects nearly four-tenths of an inch beyond the upper lip; and the small oval eye, which is covered with skin, is placed on the head not far from the base of the snout. In front of each eye is a single small nostril which does not issue in a tube.

"The gill-openings are small slits, seven-tenths of an inch in length, on the underside of the body, placed only one-sixth of an inch apart, and at a distance of about 3⅛ inches from the tip of the snout. What is very remarkable about these apertures is that, within the lips of each, the opposite sides are connected by three narrow cutaneous bands—two near the anterior end of the aperture, and one near the posterior end.

"The minute pectoral fins are placed immediately behind the gill-openings, but a little above them. Each is about one-fifth of an inch in length and has about thirty-two delicate rays. In reference to the pectoral fins of the fish described by Dr. Harwood, he mentions that they were principally composed of an adipose disk terminated and nearly surrounded by the rayed portion of the fin. In my fish I do not see anything of this kind; but that may be owing to the specimen being young.

"A low dorsal fin, having extremely slender rays, commences in front of the vent, and at a distance of about 7½ inches from the tip of the snout. There is no trace of ventrals. The vent is about 8½ inches from the snout; and behind it begins a low anal, which, though it may be traced for a considerable distance, stops, like the dorsal, short of the end of the tail.

"The hinder part of the body tapers off gradually; and the finless tail is characterized by extreme tenuity, being reduced to the thinness of a thread. Two bluish-white, parallel, closely approximated lines begin at the distance of rather more than an inch from the tip of the snout, and are traceable for a considerable space along the back, one at each side of the dorsal fin. Dr. Mitchill speaks not only of a whitish line extending on each side of the dorsal fin of his fish, but of a similar stripe at each side of the anal fin" (pp. 278, 279).

As to the relationship of these three fishes (Mitchill's, Harwood's, and Johnson's) Mr. Johnson calls attention to the description by Mitchill of the filiform processes, and distinctly says that in his fish

"there is no trace of such processes," and he therefore says: "Hence I venture to conclude that if Dr. Mitchill's fish retains the name *Saccopharynx flagellum*, Dr. Harwood's and mine ought to be designated *Saccopharynx ampullaceus*" (p. 279).

In 1859, Dr. Pieter von Bleeker, in the "Systematis Piscium Naturalis Tentamen," prefixed to his "Enumeratio Specierum Piscium hucusque in Archipelago Indico observatorum," gave a family name (Saccopharyngoidei, p. xxxiii) to this type, and isolated it as the representative of a peculiar tribe (Saccopharyngichthyini) contrasting it with another tribe (Muraenichthyini) which contained all the other families of true apodal fishes, or such as were unprovided with maxillary bones, and which formed the order "Murænæ" of his system.

In 1870, Dr. Günther published the eighth volume of his "Catalogue of the Fishes in the British Museum," and ranked the genus *Saccopharynx* as the representative of a peculiar "group," "Saccopharyngina" (p. 19) of his family "Murænidæ." He characterized the "Saccopharyngina" as "Murænidæ platyschistæ;" which have "the tail exceedingly long; muscular system very feebly developed; bones very thin; stomach extremely distensible; gill-openings separate."

The genus *Saccopharynx* was defined (p. 22) in the following terms:

"Second group. SACCOPHARYNGINA.

"2. SACCOPHARYNX.

"Saccopharynx, *Mitchill*, Ann. Lyc. New York, i, 1824, p. 82.
"Ophiognathus, *Harwood*, Phil. Trans. 1827, p. 277.

"Deep-sea Congers, with the muscular system very feebly developed, with the bones very thin, soft, and wanting in anorganic matter, connected by a lax, easily torn fibrous tissue.

"Head and gape enormous. Snout very short, pointed, flexible, like an appendage overlapping the gape. [Only one nostril can be found in front of the eye.*] Maxillary and mandibulary bones very thin, slender, arched, armed with one or two series of long, slender, curved, widely set teeth, their points being directed inward; palate toothless. Gill-openings wide, at some distance from the head, at the lower part of the sides; gills very narrow, free, and exposed. Trunk of moderate length. Stomach distensible in an extraordinary degree. Vent at the end of the trunk. Tail band-like, exceedingly long, tapering into a very fine filament. Pectoral small, present. Dorsal and anal fins rudimentary; the former more so than the latter, and indicated by a groove bordered by a whitish line on each side, and commencing at a short distance behind the head. Now and then a short fine ray occasionally visible towards the end of the trunk. Anal rays distantly placed, commence behind the vent, and are visible for some distance.

*"This part of the head is not in a good state of preservation, and the other nostril is most probably near the end of the snout."—Günther's note.

"Temperate parts of the North Atlantic."

The several forms described by Mitchill, Harwood, and Johnson were combined under the same specific name, *Saccopharynx flagellum*, which name was ascribed erroneously to Mitchill.

In 1872, Dr. Gill, in his "Arrangement of the Families of Fishes," gave the family name Saccopharyngidæ to the type in question, and placed it in the order of Apodes, but as a doubtful constituent of that order (under the caption "Apodes? incertæ sedis").

In 1880, Dr. Günther published his "Introduction to the Study of Fishes," and therein reiterated the description and opinion given in 1870.

In 1882, Messrs. Jordan and Gilbert, in their "Synopsis of the Fishes of North America," adopted the family Saccopharyngidæ, contrasting it in their phyletical table with all the other families of Apodes, and essentially accepting as the diagnosis of the family the characters given by Dr. Günther, simply correcting some verbal and grammatical infelicities of Dr. Günther.

In 1883, the authors of the present sketch, in an article "on the anatomy and relations of the Eurypharyngidæ," in their search for the other members of the order Lyomeri, referred to the Saccopharyngidæ in the following terms:

"Whether any of the other known types of fishes belong to this order is very doubtful, and, in fact, we have sufficient data respecting them to be tolerably certain that none do, unless it may be the *Saccopharynx flagellum*. *Saccopharynx* is a very peculiar type, the representative of quite an isolated family, but its structure is almost unknown. The last systematic writer who has referred to its characters (Dr. Günther) has described the genus as consisting of 'deep-sea congers, with the muscular system very feebly developed, with the bones very thin, soft, and wanting in organic matter; *head* and gape *enormous*'; '*maxillary* and mandibulary bones very thin, slender, arched, armed with one or two series of *long*, slender, widely set *teeth*, their points being directed inwards,' &c. Dr. Günther's 'maxillary' bones are doubtless palatines,* and his description is very deficient in precision, but supplemented as it is by the descriptions of Mitchill and Harwood, it is evident that the genus *Saccopharynx*, or family Saccopharyngidæ, is quite remote from the Eurypharyngidæ. More than this can only be surmised at most till its structural characteristics are determined."

This paragraph was written at Wood's Holl, and reliance was placed on the memory of the senior author, who had not read the descriptions

* Dr. Günther, we are now inclined to believe and gladly confess, was probably correct in following those authors who had called the homologous bones maxillary, rather than those (*e. g.*, Owen, Richardson, Kaup, Bleeker, *et al*) who have regarded them as palatine. (See next page.)

of Mitchill and Harwood since 1871. These descriptions were read then, with the volume of Dr. Günther in view, and naturally the description of the modern author was regarded as counterbalancing those of the older ones, although there was sufficient doubt in the mind of our senior to cause him to regard it even then as a strange form of doubtful pertinence to Apodes. At first, in our recent communication, we were disposed to collocate the family Saccopharyngidæ in the order Lyomeri, but Dr. Günther's positive statement respecting the "enormous . . . . head" and his utter silence respecting the weighty characters signalized by the older authors, finally restrained us from so doing. On our return to Washington, we availed ourselves of the opportunity to investigate the literature of the subject, and not only read but *studied* the descriptions of Mitchill, Harwood, and Johnson. These, which previously had little significance or were regarded as perhaps erroneous, were then found to be more valuable than was at first thought, and to be susceptible of being perfectly understood in the light of our recent researches. We cannot now doubt that the older authors were correct in most of the characters that they assigned to the forms examined by them, and indeed the changes which the oral parts may undergo, and the allusions made can only be understood when we concede that a fish of the Lyomerous type was under examination by them. Even the peculiar aspect of the pectoral fins, as described by Harwood, which was not appreciated by Johnson, is now capable of explanation, inasmuch as the scapular arch is quite broad and has tumid muscles, which, by the contraction of the surrounding skin, would present the appearance of an adipose disk, such as was noticed by Harwood.

In 1883 also, Dr. Gill, in our joint behalf, communicated a letter to Nature, in which he besought from English naturalists a re-examination of the specimens of *Saccopharynx* claimed to be in the British Museum, and gave the results of our studies up to that time in the following terms:

"The Lyomeri are fishes with five branchial arches (none modified as branchiostegal or pharyngeal) far behind the skull; an imperfectly ossified cranium, deficient especially in nasal and vomerine elements, articulating with the first vertebra by a basi-occipital condyle alone; with only two cephalic arches, both freely movable, (1) an anterior dentigerous one, the palatine,* and (2) the suspensorial, consisting of the hyomandibular and quadrate bones; without opercular elements; without maxillary bones, or distinct posterior bony elements to the mandible,† with the scapular arch imperfect (limited to a single carti-

*We had at first adopted the homological identification of Owen and others for the anterior upper dentigerous bones of the Lyomeri, but a study of the histology and innervation of the bones and a consideration of the mode of development of the palatine bones in typical fishes compel us to regard them now as maxillary.

†Indistinct bony elements have since been detected in the mandibular rami of a larger specimen.

laginous plate) and remote from the skull, and with separately ossified but imperfect vertebræ. Whether other than the two genera mentioned, Eurypharynx and Gastrostomus, belong to this order is not entirely certain, but there is little doubt, in the opinion of Mr. Ryder and myself, that the family Saccopharyngidæ also belongs to the order, and it is for the purpose of calling attention to this doubtful and still little known type that in behalf of Mr. Ryder and myself I address the present communication. No satisfactory information has been given as to the Saccopharyngidæ, except by Dr. Mitchill in 1824 and by Dr. Harwood in the Philosophical Transactions for 1827. The plate published in the volume cited represents the head of Ophiognathus with the mouth closed as well as open, and the differences in the relation of the posterior angles of the mouth to the axis indicate that Ophiognathus (as well as Saccopharynx) has a movable suspensorium, and would therefore exhibit the Lyomerous peculiarity of structure. It appears from Dr. Günther's 'Catalogue of the Fishes in the British Museum' (vol. viii, p. 22), that in 1870 there were two specimens of a Saccopharyngoid fish—probably the Ophiognathus ampullaceus—in the British collection. (It is possible that the so-called young mentioned in the catalogue may be a Eurypharyngoid.) The question whether that species belongs to the Lyomeri can therefore be readily settled negatively or affirmatively. Assuming that the family Saccopharyngidæ belongs to the order, the two families would apparently be distinguishable as follows:

"The Eurypharyngidæ are Lyomeri with the branchio-anal portion much shorter than the rostro-branchial; with the tail very elongated and moderately attenuated backwards; the head flat above, and with a transverse rostral margin, at the outer angles of which the eyes are exposed; with the palatine jaws excessively elongated backwards and the upper parallel, and closing against each other as far as the articulation of the two suspensorial bones; with minute teeth on both jaws; the dorsal and anal fins well developed and continued nearly to the end of the tail, and with minute, narrow pectoral fins.

"The Saccopharyngidæ appear to be Lyomeri with the branchio-anal portion much longer than the rostro-branchial; the tail excessively elongated and attenuated; the cranium unknown; the eyes antero-lateral; with the palatine bones moderately extended backwards (in comparison with the Eurypharyngidæ), and apparently not closable against each other; with enlarged teeth in one or both jaws; with the dorsal and anal fins feebly developed, and with pectorals small but broad. Saccopharynx is considered by Dr. Günther to consist of 'deep-sea congers,' but evidently it is not at all related to the congers or any other allied fishes."

III.

CONCLUSIONS.

It will be seen that naturalists had apparently settled down within the last few years to a consideration of the *Saccopharyngidæ* as a type of fishes having no exceptional characters, or even, in the words of Dr. Günther, as being simply "deep-sea congers," and yet, when we study the works of the older authors, from whom we would naturally expect to glean little information to correct the later ones, we find a number of remarkable characters alluded to. Such are, (1) the general form and the relations of the parts to each other, for which the Saccopharyngidæ are so peculiar, therein differing very widely from all the true eels; (2) the head, which was specifically described by Dr. Mitchill as being "smaller than is usual in fish"; the lower jaw, indicated by the old authors as (3) having its rami not only very movable and divergible from each other, but as (4) also being itself capable of anterior and backward extension; (5) the tongue, which was declared to be entirely absent; (6) the branchiostegal bones also, in the most positive terms, said to be absolutely wanting; (7) the gills, alleged to be visible in a certain peculiar manner through the branchial apertures; (8) the pectorals, stated by one of them at least to have a very exceptional structure, and to present an appearance of being composed of an adipose disk, bounded posteriorly by the rays; and (9) the vertebral column, specifically stated, "in its progress to the tail, to lose its bones and be converted into a sort of tough and grisly appendage." All these characters are so extraordinary and deviate so much from any exemplified in true apodal fishes, that it might seem inevitable that the attention of any scientific ichthyologist at the present day would be specially arrested by such attributes, and that an examination of the form would be provoked on the part of any one having access to specimens. And yet it will be noticed that Dr. Günther, in his Catalogue published in 1872, as well as in his Introduction to the Study of Fishes, published as late as 1880, absolutely ignores all of the characters thus adverted to, and from his description no one would suppose that the fishes in question had any anomalous characters, or were especially noticeable on account of structural modifications.

IV.

SYNOPSIS.

Saccopharyngidæ.

=Saccopharyngoidei, *Bleeker*, Enum. sp. Piscium Archipel. Ind., p. xxxiii. (Not characterized: isolated as the only representative of a distinct tribe —Saccopharyngichthyini—of the "ordo 49, Murænæ," which latter is co-ordinate with the "ordo 48, Synbranchi".) 1859.

=Murænidæ Saccopharyngina, *Günther*, Cat. Fishes in Brit. Mus., v. 8, pp.19, 22. 1870.

= Saccopharyngidæ, *Gill*, Arrangement Fam. Fishes, p. 21, (Not characterized; placed with "Apodes incertæ sedis.") 1872.

= Saccopharyngidæ, *Holder*, Museum Nat. Hist., Am. Fauna, p. cc. 1877.

= Saccopharyngidæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 365. 1883.

There is still doubt as to whether the fishes examined by Mitchill and Harwood belong to the same species, or even genus. There are several notable discrepancies between the descriptions of the two observers, and while it is quite possible that they are the result of imperfect examinations, it is premature to assume that they are such. A careful study of the specimens in the British Museum may resolve the question. Meanwhile, without the expression of opinion as to the probabilities of the dilemmas, we formulate, under the respective names of Mitchill and Harwood, the most salient characters *alleged* to distinguish the two from each other. In case such differences are confirmed, the two fishes will probably be generically separable.

Saccopharynx.

Saccopharynx, Mitchill, Ann. Lyceum Nat. Hist. N. Y., v. 1, p. 86, 1824.

Saccopharyngids with the dorsal and anal fins continued backwards and confluent with a slightly developed caudal fin [?], and with the lower jaw toothless.

Ophiognathus.

Ophiognathus, Harwood, Phil. Trans. Royal Soc., 1827, p. 52.
Saccopharynx sp. auct.

Saccopharyngids with the dorsal and anal fins obsolete backwards, and without a caudal fin, the extremity of the caudal portion simply flagelliform, and with the lower jaw armed with teeth like those of the upper.

Saccopharynx flagellum.

SYNONYMY.

1824. Saccopharynx [= Stylephorus chordatus], *Mitchill*, Annals Lyceum Nat. Hist. N. Y., v. 1, p. 86.

1829. Saccopharynx flagellum, "*Mitchill*," *Cuvier*, Règne Animal, 2. ed., t. 2, p. 355, (ed. de luxe, t. 4, p. 321.)

1836. Saccopharynx ampullaceus, *Richardson*, Fauna Bor.-Americana, v. 3, p. 271.

1836. Der Geisselaal,* *Oken*, Allgemeine Naturgeschichte, v. 6 (Thierreich. v. 3), p. 126. (In part: abstract of Mitchill's description.)

1845. Saccopharynx, Mitchilli, *Anon.* (*Stephens?*), Encyclopædia Metropolitana, v. 24, p. 250.

1846. Saccopharynx chordatus, *Storer*, Mem. Am. Acad. Arts and Sc., (2,) v. 2, p. 489; Syn. Fishes N. Am., p. 237.

1862. Saccopharynx flagellum, *Johnson*, Ann. and Mag. Nat. Hist., (3,) v. 10, p. 279.

1870. Saccopharynx flagellum, *Günther*, Cat. Fishes in Brit. Mus., v. 8, p. 22 (in part).

* Geisselaal, *anglice* Whip-eel.

Vol. VII, No. 5. Washington, D. C. June 11, 1884.

1873. Saccopharynx flagellum, *Gill*, Cat. Fishes E. coast N. Am., p. 34. (Named with place of capture—"lat. 55° N., long. 30° W.")

1877. Saccopharynx flagellum, *Holder*, Museum Nat. Hist., Am. Fauna, p. ccl.

1879. Saccopharynx flagellum, *Goode & Bean*, Bull. Essex Inst., v. 11, p. —. Sep. copy, p. 27. (In part: referred to the Essex co. (Mass.) fauna on account of the capture of Mitchill's fish in lat. 52° N.; long. 30° W.

1882. Saccopharynx flagellum, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 365.

Ophiognathus ampullaceus. (Pl. I, Proc. U. S. Nat. Mus., 1884,) *ex* Harwood.

SYNONYMY.

1827. Ophiognathus ampullaceus, *Harwood*, Phil. Trans. R. Soc., 1827, p. 52,* pl. 7; f. unnumb. (entire fish); f. 1 (head with mouth closed); f. 2 (head with mouth open); f. 3 (head below).

1829. Saccopharynx [ampullaceus?], *Cuvier*, Règne Animal, 2 ed., t. 3, p. 355, (ed. de luxe, t. 4, p. 321).

1845. Saccopharynx Harwoodi, *Stephens* (?), Encyclopædia Metropolitana, v. 24, p. 250; v. 7, p. 388; Pisces, pl. 9, f. med. (lat. view entire fish, copied from Harwood).

1862. Saccopharynx ampullaceus, *Johnson*, Ann. and Mag. Nat. Hist., (3,) v. 10, p. 277, 279.

1870. Saccopharynx flagellum,† *Günther*, Cat. Fishes in Brit. Mus., v. 8, p. 22 (in part).

1879. Saccopharynx flagellum, *Bean*, Bull. U. S. Nat. Mus., No. 15, p. 133. (in part; inserted on account of the identification with *O. ampullaceus* which "was captured in the entrance of Davis Strait").

Saccopharynx flagellum also appears in Messrs. Goode and Bean's "Report on the Fishes," collected in 1880 by the United States Coast Survey steamer Blake, as the name of a fish obtained by that vessel. The fish in question, "a single badly mutilated example, was secured" in north latitude 35° 44′ 40″ and west longitude 74° 40′ 20″, at a depth of 898 fathoms. Suspecting, from a rough outline sketch Dr. Gill had seen, that it might be a *Gastrostomus*, we requested Mr. S. A. Garman to examine the specimen now in the Museum of Comparative Zoology at Cambridge, and he has written that it is a specimen of the species described as *Gastrostomus Bairdii* (Gill & Ryder, Proc. U. S. Nat. Mus., v. 6, p. 262). Dr. Bean also had previously thought that the specimen might be a *Gastrostomus*, and informs us that the identification with *Saccopharynx* was provisional.

* The reference to "Ophiognathus, Harwood, *Phil. Trans.* 1827, p. 277," given by Dr. Günther and quoted by Jordan and Gilbert, is erroneous; as will also be noticed, no plate is referred to by Dr. Günther.

† The reference to "Saccopharynx flagellum, *Mitchill, l. c.*," i. e., "*Ann. Lyc. New York*, i, 1824, p. 82," is entirely erroneous. As has been before stated, no such name as "Saccopharynx flagellum" is to be found in Mitchill's memoir, and the name *Saccopharynx* is only recorded at p. 86.

ON DOMESTICATED HYBRID DUCKS (ANAS BOSCHAS + OBSCURA).

By ELISHA SLADE.

The Mallard (*Anas boschas*) and the Dusky Duck (*A. obscura*) breed regularly in this neighborhood (Bristol County, Massachusetts). A brood of ducklings of the latter, about a month old, was caught in the summer of 1876. They bred in 1877, one female laying eighty-four eggs in eighty-five days before she wanted to set. During the year 1877 the drakes were destroyed by accident, and of the young which were raised all were ducks. In 1877 young wild Mallards (*A. boschas*) were caught; and, being unable to procure a dusky drake (I wanted very much to have a flock of *A. obscura*), the Mallard drakes were mated with the dusky ducks. I now have in my yard one of the dusky ducks of 1876, and one Mallard drake of 1877, and the rest of the birds are lineal descendants of this pair. The hybrids show in color a very nearly equal blending of the two species in each sex, and are perfectly fertile *inter se*. The birds mate regularly without quarreling, and in every instance have remated each spring—the union lasting for life, probably. The only restraint on the birds since 1877 has been an annual clipping of the left wing; otherwise they have full liberty. When the ducks set, every egg hatches, and the period of incubation does not vary thirty minutes from twenty six days and four hours. The eggs set under hens hatch on the twenty-sixth or twenty-seventh day, according to circumstances. The ducks lay from sixty to ninety eggs each before wanting to set, sometimes in one place, but occasionally in different places; and if not indulged in setting will lay again in a few days. They have averaged ninety-six eggs apiece for the spring and summer term, and twenty for the fall term of laying. Prior to 1880 the young ducks were difficult to raise, probably from the changed condition of food and environment, but since then they are as hardy as common ducks. Rats (*Mus decumanus*) are a scourge, in fact are very destructive, and have destroyed ten to twenty or more ducks, from a day to a week old, in a single day and night. If there was any possible way of protection from this source of loss, I should as much expect to raise the same per cent. of ducks as of chickens.

The later-hatched birds have increased in size to some extent, have somewhat thicker legs, and, from abundance of food and lack of flight exercise, are slightly less graceful in movement than the earlier birds. But they are not yet demoralized by domestication nor denaturalized by the tribute they are paying to the science of natural history. There are no ponds nor streams on my premises, and their supply for drinking and bathing is furnished two or three times daily in shallow dishes.

I have one pair of birds mated and fertile, of which the male is three-fourths Mallard and one-fourth Dusky Duck, the female three-fourths Dusky Duck and one-fourth Mallard.

ON PROCHLORITE FROM THE DISTRICT OF COLUMBIA.

By GEORGE P. MERRILL.

The presence in the schists of the District of Columbia of a chloritic mineral not apparently resulting from the alteration of the included hornblende or mica was recognized by the writer a year or more ago, but until lately no sufficient amount of the material was found for an exact determination of its mineralogical species. While searching for rutile on Foundry Run, some 1½ miles northwest of the city of Washington, not long since, he was, however, fortunate enough to find a mass of this mineral of sufficient size and purity to admit of satisfactory examination.

The mineral occurs in the form of a compact aggregate of small scales of a beautiful deep green color, the individual laminæ of which are from one to two millimeters in diameter and of very irregular outline.

Examined by the microscope it is found to be biaxial, though the axial divergence is not large. Sections across the cleavage show a fan-shaped or radial arrangement of the laminæ, which are of a yellowish-green color, becoming green whenever the cleavage lines correspond with the plane of vibration of the light. The polarization colors are dull and of a greenish-gray hue. In hardness it is about 1.5, and its specific gravity, as determined by a Jolly balance, is 2.835. Before the blowpipe it fuses with difficulty on the thin edges, and becomes slightly magnetic. Chemical analysis by Prof. F. W. Clark, chief chemist of the Geological Survey, resulted as follows:

	Per cent.
Silica	25.45
Alumina	17.88
Magnesia	15.04
Iron protoxide	24.98
Soda	.67
Water	14.43
	98.45

The associated minerals are very dark green hornblende, a yellowish-gray finely granular crystalline mineral which is believed to be zoisite, much iron pyrites, and, in the more quartzose portions of the rock, black tourmaline and rutile.

NATIONAL MUSEUM, *April* 10, 1884.

MELANETTA FUSCA (LINN.) IN ALASKA.

By ROBERT RIDGWAY.

Among the birds collected by Mr. C. L. McKay, U. S. Signal observer at Bristol Bay, Alaska, is a fine adult male of the European Velvet Scoter, obtained at Alloknagik Lake, July 20, 1882 (Nat. Mus. No. 92149, collector's No. 104).

This species may be readily distinguished from its American representative, *M. velvetina* (Cass.) Baird, by the longer culmen, the distance from the tip of the bill to the frontal feathers being greater than from the same point to the most anterior loral feathers; the relative measurements being reversed in *M. velvetina*. This character holds good in both sexes, and also in young birds. In the adult male of *M. fusca* the side of the base of the maxilla (near the rictus) is much more swollen than in *M. velvetina*, but at the same time the base of the culmen is decidedly less elevated. The colors of the bill are much the same in the two species, but *M. fusca* has a distinct black line running on each side of the nail, connecting the upper and lateral black areas.

This is the second known occurrence of *M. fusca* in America, the first record being that of Dr. Reinhardt in *Vid. Medd. Nat. For. Kjöbenhavn*, 1869, p. 1, where a specimen from Southern Greenland is reported. It is true that Mr. Nelson, in his "Birds of Bering Sea and the Arctic Ocean" (Arctic cruise of the revenue steamer Corwin in 1881, published in 1883, p. 102), gives *M. fusca* as the Alaskan species, but he, in common with some other writers, does not distinguish the two species. All Mr. Nelson's specimens which I have had the opportunity of examining in this connection, are *M. velvetina*, as are all other Alaskan examples that have come under my notice, except the one above referred to. *M. fusca* is the species of Eastern Asia, and may, therefore, like some other Palæarctic birds, straggle more or less frequently to the American side.

DESCRIPTION OF A NEW SNOW BUNTING FROM ALASKA.

By ROBERT RIDGWAY.

Plectrophenax hyperboreus Ridgw. *McKay's Snow Bunting.*

SUBSP. CH.—*Adult ♂ in spring* (No. 78551, Saint Michael's, Alaska, April, 1879, E. W. Nelson): Entirely pure white, except the terminal portion of the five outer primaries, which are chiefly black, for the space of about 1.40 inches from the tip of the longest quill. Tail pure white, the middle rectrices with a very small blackish spot near the end of the inner web (almost obsolete on one feather). Bill dull brownish,

the tip dusky; legs and feet deep black. Wing 4.65, tail 3.10, culmen .45, tarsus .90, middle toe .60.

Adult ♂ in winter (No. 92090, Nushagak, Alaska, December 10, 1882, C. L. McKay): Like the spring plumage as described above, but pileum strongly tinged with rusty brown, the auriculars washed with a paler shade of the same, and jugulum with a very faintly marked pale rusty collar, more distinct (but still faint) on each side; lower back and rump also faintly washed with pale rusty. Black spots near ends of inner webs of middle rectrices more distinct, and black on ends of primaries rather more extended, that on inner web of outer quill reaching about 1.70 from the tip. Bill wax-yellow, with dusky tip to the maxilla. Wing 4.60, tail 3.15, culmen .40, tarsus .95, middle toe .60.

Adult ♀ in spring (No. 78556, U. S. Nat. Mus., Saint Michael's, Alaska, April, 1879, E. W. Nelson): General color white, the pileum and auriculars tinged with rusty, the nape and back faintly washed with pale buff-yellowish, and back very narrowly streaked with dusky, but these narrow streaks rapidly widening toward the roots of the feathers so as to form the predominating color of the concealed portion; scapulars more strongly tinged with ochraceous, and with still broader concealed dusky acuminate spots, but without distinct streaks on the surface. Tertials with the central part of the exposed portion blackish, the very broad marginal part light dull ochraceous, becoming nearly white at the tips of the feathers; alulæ dull black, bordered with white; primary coverts similar, but greater portion of inner webs white; longer primaries chiefly dusky grayish, distinctly bordered with white and with basal half or more of inner webs wholly white; on the shorter primaries this dusky rapidly decreasing in extent until on the innermost quill there is a mere trace near the tip of the outer web. Four middle rectrices brownish dusky, bordered with white; rest of the tail white, but all the feathers with more or less of a dusky streak near end of the outer web. Bill brownish wax-yellow, the culmen dusky; feet brownish black. Wing 4.25, tail 2.90, culmen .45, tarsus .85, middle toe .60.

Adult ♀ in winter (No. 92091, Nushagak, Alaska, November 16, 1882; C. L. McKay): Similar to the spring plumage, as described above, but upper parts much more strongly washed with rusty, this deepest on the pileum and auriculars, but also pervading the nape, whole back, and scapulars, and, but less uniformly, the rump; an interrupted or broken jugular collar of rusty touches or cloudings; broad margins of the tertials deep cinnamon. Bill paler and purer wax-yellow, without black on culmen; feet deep black. Wing 4.25, tail 2.90, culmen .40, tarsus .87, middle toe .58.

Of this remarkably fine and easily recognized species I have examined altogether seven specimens, three adult males and four females, all of them obtained in Alaska in winter and early spring. The summer home of this bird is probably the unknown region to the north of the Artic mainland, since at the extreme northern point of Alaska only the true

P. nivalis breeds, Messrs. Murdock and Smith, of Lieutenant Ray's party, having brought back with them from Point Barrow numerous specimens of the latter, together with the nests and eggs.

The fully adult male may be at once distinguished from that of *P. nivalis* by the total absence of black except on the terminal third (or less) of the primaries and near the ends of the middle rectrices. In *P. nivalis* the primaries are black nearly to the base, the alulæ, primary coverts, and tertials also black (though bordered with white), the dorsal region mainly black (wholly black in summer), and the six middle rectrices black to the base. The rusty wash is also much paler in the new form.

In its summer plumage, the entire plumage, except the black quill-tips, would evidently be snow-white, the bill black instead of yellow.

The females are distinguished from those of *P. nivalis* by their much paler coloration, with the dark markings far more restricted, and the rusty wash of the winter dress much less distinct. All of the four specimens of this sex have the back white, more or less tinged or stained with yellowish (more rusty on the scapulars), and narrowly streaked with black, although these streaks are nearly obsolete in one specimen.

The vernacular name of this new species is bestowed in memory of Mr. Charles L. McKay, who sacrificed his life in the prosecution of natural history investigations in Alaska, and in whose collections the new species was first noticed. The specific name *hyperboreus* needs no explanation.

ON THE USE OF TRINOMINALS IN AMERICAN ORNITHOLOGY.

By LEONHARD STEJNEGER.

Ornithological trinominals, although at present more *generally* employed in America than elsewhere, are neither an American invention nor were they first applied in America to the extent which they are now occupying in this country.

That trinominals for varieties occasionally are found in some early works, even in those of Linnæus, is of very little significance, although Pallas came pretty near being a trinominalist in the modern sense of the word. Nor do I intend in this connection to call attention to the numerous trinominals of C. L. Brehm, as he used them in a somewhat different sense from what we do.

The father of modern trinominalism in ornithology was the famous Swedish ornithologist, Carl Sundevall, who in 1840 commenced to treat systematically the ill-defined species as geographical varieties, which he provided with a third name in addition to the specific appellation. Of groups treated by him in that manner may be quoted the genera *Acanthis*, *Budytes*, *Lagopus*, *Dendroeca* and the family *Picidæ*. He himself styled these varieties "local forms" or "races," as an example of

which may be enumerated the varieties of *Dendroeca petechia*, recognized by him in 1869 (Öfv. Vet. Akad. Förhandl., 1869, pp. 607–609):

Dendroeca petechia:

a. bartholemica.
b. cruciana (=ruficapilla Baird).
c. barbadensis.
d. cubana (=gundlachi Baird).
e. jamaicensis (=petechia Baird).
f. gallapagensis (=aureola Gould).
g. peruviana?
h. aequatorialis?
i. panamensis? (=vieilloti Cass).

All of which he properly described.

He was closely followed by Herman Schlegel, who, in 1844, applied the system to all the European birds in his "Revue critique des oiseaux d'Europe." In this catalogue he enumerates 489 species, plus 27 subspecies or varieties, the latter designated by trinominals, *e.g.:*

Anthus pratensis rufigularis.
Motacilla alba lugubris.
Motacilla flava rayi.
Motacilla flava cinereocapilla.
Motacilla flava melanocephala.
Garrulus glandarius melanocephalus.
Sturnus vulgaris unicolor.
Passer domesticus cisalpinus.
Uria grylle mandtii.

From this enumeration it is perfectly clear how "modern" Schlegel was as early as 1844, not only in adding the subspecific name without any connecting word or letter, but also by acknowledging the law of priority in the use of the trinominals, which Sundevall failed to do. For every 18 binominals this first trinominalistic list of the birds of Europe contained 1 trinominal.

From that moment it is difficult to find ornithological writers of any prominence on the continent of Europe who have not, at least occasionally, used trinominals, while several authors applied three names to geographical races quite freely, for instance, Bonaparte, Middendorff, v. Schrenck, Malmgren, etc.

But the idea of Sundevall and Schlegel was further developed by faithful followers. In 1861 J. H. Blasius printed in the German language a list of the birds of Europe for his own private use. The following year (1862) this list of "one of the highest authorities in this branch of the science" was reprinted in England with the author's additions, and edited by Prof. Alfred Newton under the title "A List of the Birds of Europe." This list enumerates 523 species (420 breeding or regularly visiting + 103 accidental visitors), designated by binomi-

nals, besides 92 subspecies designated by trinominals and quadrinominals; in other words, for every $5\frac{2}{3}$ binominals we find 1 tri- or quadrinominal; quite a progress since Schlegel's list!

A few quotations from this "check-list" will convince us that the theory of the geographical races and the applications of the rules now *en vogue* here in America were thoroughly understood and employed.

"*Falco peregrinus* Brisson.—Eur.
- β. *anatum* Bp.—Am.
- γ. *melanogenys* Gld.—Oceanica.
- δ. *peregrinator* Sund.—Asia.
- ε. *minor* Schleg.—Afr.

Cinclus aquaticus, Briss.—Centr. South. Eur.
- β. *melanogaster* Brhm.— North. "
- γ. *leucogaster* Eversm.— " As.
- δ. *pallasii* Temm.—N. As.

Loxia curvirostra L.—Eur.
- β. *americana* Wils.—N. Am.

L. leucoptera Gm.—N. Am., Engl.
- β. *taenioptera* Glog.—N. Eur.

Charadrius pluvialis L.—N. Eur.
- β. *virginicus* Bk.—N. Am.
- γ. *longipes* T.—As."

Etc., etc.

As already mentioned, in some instances he applies quadrinominals, an example of which may be given here:

"*Budytes flavus* L.—Eur.
- *a. melanocephalus* Lcht.—S. Eur.
  - β. *kaleniczenckii* Andr.—E. S. Eur.
- *b. borealis* Sund.—N. Eur.
  - β. *cinereocapillus* Savi.—Centr. & S. Eur.
  - γ. *flavus* L.—Eur.
- *c. flaveolus* Gld.—Centr. & W. Eur.
  - β. *campestris* Pall.—E. Eur."

Blasius's List of the Birds of Europe was not the first in which trinominals were used, nor was it the last. It was followed by the "Conspectus Systematicus and Geographicus Avium Europæarum, Auctore Alph. Dubois," which was published in 1871, a year before Coues's Key. "Varietates climacterica cum litteris italicis sunt impressæ et comitatæ litterâ græcâ." Five hundred and seventy-five species, designated by binominals, are enumerated plus 125 "climatic varieties," designated by trinominals, or 1 trinominal for every $4\frac{2}{3}$ binominals.

In the mean time the American ornithologists had not failed to appreciate the advantages, or rather the dire necessity, of trinominals for geographical races in many cases. John Cassin is probably the first American writer using trinominals, as he as early as 1854, distinguished

the races of *Bubo virginianus* as follows (Illustr. B. Calif., Tex., etc., p. 178): *Bubo virginianus*

Variety, *atlanticus*, [new name].
Variety, *pacificus*, [new name].
Variety, *arcticus*, [*B. Arcticus* Swains.].
Variety, *magellanicus*, [*S. magellanicus* Gmel.].

Although the trinominals are rather few in "The Birds of North America," (1858), still that work and that date are of great interest, because they show that Professor Baird, in using them and inventing new ones, favored the principle, which, afterwards, on his great authority, was so generally accepted by North American Ornithologists. In fact, the trinominals of present American ornithology can with great propriety be said to date from 1858, when that great work was published, which still exercises its influence through the "History of North American Birds," an influence strong enough to retain for the present epoch of American ornithology the name of "the Bairdian Period," and which has formed the "American school," if such a term is admissible.

Of trinominals dating from 1858 may be mentioned:*

Turdus pallasi var. *silens*.
Picus villosus var. *major*.
var. *medius*.
var. *minor*.
Bonasa umbellus var. *umbelloides*.

The principle thus accepted was not discarded in the same author's, unfortunately unfinished, "Review of American Birds" (1864–1866), from which we select the following list:

Thryothorus bewickii, var. *bewickii*.
Thryothorus bewickii, var. *leucogaster*.
Thryothorus bewickii, var. *spilurus*.
Thryophilus rufalbus, var. *rufalbus*.
Thryophilus rufalbus var. *poliopleura*.
Troglodytes ædon, var. *aztecus*.
Troglodytes hyemalis, var. *pacificus*.
Cistothorus palustris, var. *paludicola*.
Atticora cyanoleuca, var. *montana*.

It was not long before the example thus set was followed. In January, 1865, Henry Bryant, in describing *Parus hudsonicus*, var. *littoralis*, expressed himself thus: "I am inclined myself to consider *P. atricapillus*, *septentrionalis*, *meridionalis*, and *occidentalis*, as varieties of one species" (Pr. Bost. Soc. Nat. Hist., 1865, p. 368), and in the beginning of the following year, he said, "The West India Islands possess peculiar forms generally recognized by ornithologists as species, but which it seems to me more rational, in many instances, to consider as local forms

*We should not forget that Prince Max von Wied also is found guilty of using trinominals in that very year, for instance, *Hirundo riparia americana*, (Journ. f. Orn., 1858, p. 101).

or varieties." (Pr. Bost. Soc. Nat. Hist., 1866, p. 248.) In the paper in which we find the above words he applied the following trinominals:
Certhiola flaveola Var. *portoricensis.*
Fringilla zena Linn. 1758 Var. *portoricensis.*
Icterus dominicensis Var. *portoricensis.*
Icterus dominicensis Var. *hypomelas* Dubus.
Saurothera vieilloti Var. *rufescens.*

In his additional "List of Birds seen at the Bahamas" (Pr. Bost. Soc. Nat. Hist., xi, pp. 63 seqv.) he uses:
Psittacus collarius var. *bahamensis.*
Tyrannula stolida var. *lucaysiensis.*
Mimus polyglottus var. *bahamensis.*

And in a paper on Birds of St. Domingo (l. c., pp. 89, seqv.), the following trinominals:
Tyrannula stolida var. *dominicensis.*
Tyrannula carribæa var. *hispaniolensis.*
Turdus ardosiaceus var. *portoricensis.*
Fringilla zena var. *marchii.*
Hirundo euchrysea var. *dominicensis.*

So great was the power of the example, that even at that early date few of the ornithologists could resist using—although more or less sporadically—trinominals, an effort especially visible in the younger generation, which may fitly be termed "Baird's school." It is unnecessary in the present paper to go into details, but a few instances may be mentioned.

In 1866 Dr. Coues, in a paper on "the Ornithology of Arizona Territory" (Pr. Phil. Acad., 1866), instituted several trinominals:
Chrysomitris (Pseudomitris) mexicanus. A. var. *mexicanus.* B. var. *columbianus.* C. var. *arizona.*

Mr. Ridgway (Pr. Phil. Acad., 1870), enumerates the following American forms of
Tinnunculus sparverius
var. *sparverius.*
var. *australis.*
var. *isabellinus.*
var. *dominicensis.*
var.? *cinnamominus.*

In fact, trinominals were in the air infecting all, so that we find them where least expected. They make their way into Mr. Lawrence's papers on birds from South and Central America, Mexico, and the islands of Tres Marias and Socorro (1871), partly as manuscript names of Professor Baird, partly without his name appended, for instance:
Conurus holochlorus var. *brevipes* Baird, M. S.
Buteo borealis var. *montana* Nutt.
Falco peregrinus var. *nigriceps* Cass.
Hadrostomus aglaiæ var. *affinis* (Elliot).
Haliplana fuliginosa var. *crissalis* Baird, M. S.

The trinominals in Dall and Bannister's paper on the Birds of Alaska (Tr. Chicg. Acad. I, 1869,) rest also evidently mainly on Professor Baird's authority.

Buteo swainsoni var. *insignatus.*
Pyrrhula coccinea var. *cassini* Baird.
Pelidna alpina var. *americana* Cass.
Bernicla canadensis var. *occidentalis* Baird.

But while thus most of the American ornithologists of that date had their attention drawn to the establishment of varieties or local races, one of them, Prof. J. A. Allen, looked at the other side, pointed out the value of the species, and determined the difference between the species and the subspecies. Although no trinominals are found in his great work "On the Mammals and Winter Birds of East Florida" (Bull. Mus. Comp. Zool. II, No. 3, 1871, pp. 161–450), still that article promoted trinominalism in America more than any before by treating the subspecies as synonyms under the species, applying to the latter "the test of intergradation." It is his great merit to have formulated this principle, without which Sundevall's and Schlegel's idea would not have gained so easy a victory in America. Subspecies are distinguishable forms which intergrade, while species do not intergrade: Here was the clue found, here the guidance to a methodical and consistent trinominalism. Others have tried to define similar principles, involving them in obscure theoretical and philosophical phrases, while he, a true and sound "American," fixed the only practical rule in a few and simple words.

The effect of his work in promoting trinominalism is very patent in the review of it written by Dr. Elliott Coues (American Naturalist, June, 1871, pp. 364–373), as shown by the following quotation (p. 371): "But we insist upon the advisability, *in the present stage of our science*, of recognizing geographical and *some other differentiations* by name," and in the appended foot-note he remarks: "Not necessarily a 'specific' name, but some one additional word, with or without the sign 'var.,' that shall stamp the form we wish to signalize. *Perhaps* this would be a judicious middle course, most applicable to the present state of the science."

We have now in our sketch reached about the year 1871. This year and the next following ones were marked by an unusual activity on the side of our ornithologists; new countries were disclosed, and new material was coming in rapidly, and the large series now accumulating in the museums proved intergradation between many forms which had been regarded as valid species.

At this same time two great works on North American ornithology were in preparation, Baird, Brewer, and Ridgway's "History of North American Birds," and Dr. Elliott Coues's "Key."

It is almost a matter of course that from what is said above trinominals should become a prominent feature of both these works. The systematic application of trinominals to the whole North American ornis

had simply become a necessity. Coues's "Key," as the less voluminous work, was published (1872) before the "History," thus becoming the first list of North American birds in which trinominals are generally and systematically applied. In the "Key" we meet 1 trinominal for every 4.9 binominals.

The history of trinominalism in North American ornithology after that date is familiar to every one. We all know how it, like many novelties in the beginning, was carried too far, good species being reduced to varieties on insufficient evidence, or on no evidence whatever, the mere supposition of intergradation, in many cases, being enough to bring the change about, while a more recent time has witnessed a sound reaction and a more rigorous application of Allen's golden rule, "the test of intergradation" being now thus interpreted, that no reduction of a species shall take place unless the intergradation is clearly established. In that, as in so many other respects,* R. Ridgway's Nomenclator of 1881 was a great progress. The proportion in the latter between trinominals and binominals is as 1 to $4\frac{3}{4}$.

In order to show how close the American trinominalists come to their European predecessors, the proportional numbers are put together in the following table:

Schlegel (List of European Birds, 1844)	1	trinominal to	18	binominals.
Blasius (List of European Birds, 1862)	1	" "	5.6	"
Dubois (List of European Birds, 1871)	1	" "	4.6	"
Coues (Key, 1872)	1	" "	4.9	"
Ridgway (Nomenclator, 1881)	1	" "	4.7	"

It is plain from the above that the ornithological trinominalism cannot be spoken of as "*the* American idea."

But also in other directions Sundevall has exercised a great influence on the so-called "American school." He was the vigorous and persistent advocate of Linnæus's tenth edition (1758) as the starting point of zoological nomenclature, a view now accepted by almost all American ornithologists, and it is his system—amended and somewhat changed by his countryman, Prof. W. Lilljeborg—which is the arrangement adopted by the Smithsonian Institution, and still met with, with some alterations in the details, in the publications of Coues and of Ridgway, and consequently of most other American writers. I do not see how the name "the American school" can be maintained in view of these facts.

Nevertheless there is a feature in which the American writers after 1858 differ from their European brethren, both English and Continental, and it is this peculiarity which led me on a previous page to adopt the name "the Bairdian school," as Professor Baird most certainly was the originator of this particular feature. I shall try to express what I mean by giving an example. When treating of two forms and their

* As for instance, in doing away with the cumbersome "var." between the specific and subspecific name.

intergradation, a European ornithologist will usually express himself thus: "I have before me a specimen which in every respect is intermediate between the two alleged species, thus proving them to be only different stages [or varieties] of the same specific type." The American, on the other hand, will say: "I have before me a specimen, No. — of the ——— collection, an adult male, shot on the —— of ———, and collected by Mr. ——— at ———, which, by presenting such and such characters, is intermediate," etc. In the first case you have to take the man's word that there is such an intermediate link; in the second you can trace the statement back to its source, you can control and criticise, or, in other words, in the European school you have to deal with the person, in the "Bairdian" with the fact, the specimen; the difference between the two and the scientific soundness of the latter process is too plain to require further comment.

It has been said by one of the prominent promotors of trinominalism in this country that the great danger of the system is the opportunity for immature specialists to name as subspecies forms too slightly differentiated to require any such formal recognition, and that consequently our lists of synonyms would be overburdened.

To me it seems as if this prediction is not warranted by past experience. In Europe the system has existed, although not on a very extensive scale, for forty years or more; still, if we examine the synonymies of European birds, we will see that with the exception of the trinominals of C. L. Brehm, who was not an immature specialist, and whose trinominals do not belong here—very few trinominals mix with the formidable lists of synonymous binominals. The American synonymical lists show the same thing, because the rather numerous trinominal synonyms are mostly put down to show the different "combinations" of the three names. We will have the same result if we go over the number of subspecies described in America during the ten years between 1871 and 1881. Consulting Ridgway's "List of untenable species and races of North American birds described since 1858," in his "Nomenclator," p. 80, we find that 11 trinominals are untenable, while of species described during the same period 9 binominals do not hold good. It is safe to say, however, that if trinominals had not come into use several of the forms described as trinominals would have entered our lists of synonyms as pure binominals. It is further plain that the percentage of the untenable trinominals is vastly smaller than that of the binominals, as during those ten years an overwhelming majority of the new forms described consisted of trinominals. The untenable trinominals (according to the list quoted) rest on the following authorities: Baird; Baird, Brewer, and Ridgway; Cooper; Coues; Ridgway; of these Cooper is guilty of only one.

The danger, it will be seen, is not very formidable. Nor do I think that a swelling of the synonymies is of any real harm to science; it causes some inconvenience to those who have to compile or copy those

lists, but the harm done to science itself can be but slight. It is a peculiarity of the construction of an ornithologist's heart that it takes a great pleasure in "sitting down" upon the new forms described by any fellow-ornithologists. In fact there are writers who think it more interesting to reduce names than to establish new ones. Under such circumstances the untenable forms will soon be disposed of and be given their proper place in the synonymies.

The trinominal system involves another danger, however, which may be injurious to the true interest of science. I mean the untimely reduction of good and distinct species to mere races or varieties. Not only does it cause great instability and uncertainty in our nomenclature, but it tends to prejudice the forms if once reduced, by an authority, on insufficient evidence. We still see almost every day undoubted species, the distinctness of which has long ago been proved over and over again, designated by the cumbersome and misleading trinominals. Here is real danger, real harm! Fortunately, however, the reaction has commenced in this country, but in Europe the latest and most eloquent advocate of trinominals tries to continue the work of Blasius.

The necessity or desirability of trinominals has of late been questioned by nonprofessionalists. The replies in "The Auk" have been so thorough on that side of the question which they have treated that little needs to be said by me. But I have an impression that the inquirers have not got *all* their questions answered nor *all* their doubts solved.

The above question is in reality a threefold one. (1.) Is it necessary to recognize those slight differences which are seen in the so-called local races? (2.) Is it necessary to have them designated by a separate name? (3.) Why is the trinominal designation to be preferred?

(1.) To the first question I would say that it is of vital importance to ornithology as a science that these minor differences be recognized. It may be well enough for those whose chief object is to label specimens in collections and museums to ignore these difficult cases in which the identification has to be done by a trained eye and a trained mind, but it must be observed that such persons have no idea of what the science requires, nor are their services to science of particular value. It is confessedly, in many cases, very difficult to distinguish between two closely-allied forms, but it is as important in ornithology that the differences be not overlooked as it is in any branch of the invertebrates, although nobody thinks of giving up specific distinctions among the small animals, because an amateur or a dilettante is unable to tell animalcules of one order from those of another. I am indebted to my friend R. Ridgway for being permitted to quote the following abstract of a manuscript of his, which seems to me to illustrate more fully what I have hinted at above:

"The most important advantage of trinominals is that they serve as convenient 'handles for facts,' in providing for the naming of forms which are known not to possess the requirements of true species, but

which it is equally evident demand, in the interests of science, proper recognition. Without trinominals it would be necessary to either name such forms as species, and thus convey an idea of their rank which the person bestowing the name knows to be false, or else ignore them altogether, which would be plainly a dereliction of duty and a positive impediment to the progress of the science. Every local or geographical variation of size, form, or color, no matter how slight, if reasonably constant, is just so much evidence affecting the question of the derivation of species, and no excuse for the exclusion of such evidence can be allowed. The inability of a person who has not access to specimens for comparison to discriminate between slightly differentiated forms—or the professed inability of the professional, whose ideas are "inspired," and who therefore finds it unnecessary to descend to the drudgery of handling specimens—is not a matter to be considered. As well might one become a physician, and be able to diagnose correctly any disease, by simply having a taste for the medical profession and no opportunity to devote his time and thought to the subject—or, on the other hand, having the opportunity and means, yet discarding all the essential aids to his knowledge."

The importance of distinguishing between even slightly differentiated local forms may be illustrated by an example.

Suppose we knew a species the breeding range of which included the Eastern and Middle States of North America and the West India Islands. Suppose, also, that we knew that it occurs during the winter in the West Indian Islands (the species consequently being resident there), in Eastern Mexico, and Central America. Considering the migration of such a species, we would face several important questions: Do the birds living in the Eastern States during the summer pass the winter on the West India Islands, and on which? Or do they travel round the Gulf, uniting with those from the Mississippi Valley in going down to Mexico and Central America? It will be seen that the solution of the questions is rather difficult. How are we going to tell the birds coming down in winter from the States from those remaining the whole year in the Antilles? We might establish observers all along the coast to be on the lookout where the migrants were wending their way, but I am afraid the evidence would be hard to obtain, as even the whole A. O. U. "committee on migration," with all its observers, might look in vain for the passing birds. Or we might catch lots of the latter, and have them marked by differently colored ribbons, or the like. True if we could possibly do it, the question might be solved in that way. I think, however, we will agree that the project is not practicable. But if nature herself had marked the birds, then we could tell just as well! If we could possibly distinguish those living the whole year in the Antillean Islands from those breeding in the East, and the latter again from the inhabitant of the Mississippi Valley, no matter how slight the distinction, no matter how expert the identifyer needs be, only let it be possi-

ble to distinguish them, then we would have the material for the solution of a very important question in ornithology. There needs be no one on the spot to be able to distinguish them, but there should be collectors willing to furnish the expert with the material. We will, in order to show what we mean, furthermore suppose that collections of large series made during the winter were turned in to the National Museum from several of the Antilles, from the eastern coast of Mexico, and from Yucatan. Suppose the Antillean specimen belong to the form residing there during summer, and to that only, except the collection made during the migrating season at the western point of Cuba, which, like winter birds from Yucatan, belonged to the form of the Eastern States, and finally that the winter birds from Eastern Mexico were identical with those from the Mississippi Valley.

Anybody can now draw the conclusions, can now understand how extremely important the distinguishing of nearly allied races really is. It has been said that these are "small things," but it must not be forgotten *that in science nothing is small which leads to finding the truth*, and that the great things are only the accumulation and the products of the small ones. *To neglect "small things" is to neglect science itself!*

The time when our museums were content with having a few specimens of each species is a past one, and at the present date they require large series. It will therefore be seen that it matters very little if in a certain local form the number of "pure-bred" or "typical" specimens should only amount to, say, 75 per cent., as these will be fully sufficient to recognize the form with certainty.

So important is the minute distinction of local forms, that the solution of the whole question of bird migration depends upon it. Prof. Johan Axel Palmén, the prominent tracer of the traveling routes of the birds and the great authority on all questions relating to their migration, the author of "Die Zugstrassen der Vögel," does not call these races geographical or local forms, but "the migrating route forms."

(2.) The second question was whether it is necessary to have these slightly differentiated forms designated by a separate name, admitting, as we now do, the necessity of recognizing them.

Before giving a direct answer I will make a counterquestion. Nobody thinks for a moment of discarding the separate names of undenied species, the characters of which are just as minute as those of a subspecies, provided only they are absolutely constant. What is now the object of naming these by a separate appellation, forms which perhaps are of less interest than a great many of the so-called subspecies?

The whole thing amounts to this, that if we do not give these forms a separate name, then we will have to use a long phrase to express which form we mean. The discarding of separating subspecies by separate names would bring them and their nomenclature just in the same condition as were the specific names before Linnæus. We designate the subspecies and species by a separate name for the same reason.

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(3.) Finally we will have to consider the question why the trinominal designation is to be preferred.

I need not repeat the many good reasons admirably set forth by Prof. J. A. Allen in the first number of "The Auk," but I will simply state why I have been of late converted to trinominalism. The question with me hinged on the consideration that in all probability we would have to give up the hope of seeing these forms recognized at all if we would not consent to having them designated differently from the species. There are still many ornithologists who would rather suffer the local races to be extinguished from our books than they would allow them to carry the "sacred" binominals. To them the subspecies are pariahs, which must not be admitted to the "rank" of the aristocratic species. I, myself, think better of the poor subspecies, believing that science in time, when they are fully understood, will derive great benefit from their recognition, and consequently I accept the cumbersome trinominals rather than to see them go around without any name at all.

I regard the trinominals as a nuisance, but as a *very necessary* nuisance, unfortunately. However, I find I can get along with them very well.

Before dismissing the subject I should like to call the attention of American ornithologists to the fact that there are other conditions which may affect the differentiation of subspecific (first, and afterwards specific) forms than the geographical distribution *of the present day*. And in order to learn just what these conditions are it is very important to have the subspecies distinguished. The geographical range of a bird is by no means a very stable thing, and may change comparatively rapidly, for many reasons. It may therefore be that some of the variations date back to a—perhaps not so very—distant time when the range of the form was one quite different from the present one. The fact that the differentiation in a certain form does not agree with what we conclude it ought to do compared with other forms of similar geographical distribution must not lead us to disregard their differences.

SMITHSONIAN INSTITUTION,
Washington, D. C., May 12, 1884.

DESCRIPTIONS OF SCAROID FISHES FROM HAVANA AND KEY WEST, INCLUDING FIVE NEW SPECIES.

By DAVID S. JORDAN and JOSEPH SWAIN.

In a recent collecting tour to Havana, Cuba, and Key West, Florida, Professor Jordan obtained a considerable number of Scaroid fishes, representing fourteen species. Seven of these were secured at Key West

and thirteen in the markets of Havana. Five appear to be still new to science, or at least not yet recognizably described.

Our materials are not yet sufficient for a general revision of the American Scari. Very few of the many species can yet be said to be well known, and the present paper is offered as a contribution toward an exact knowledge. We give descriptions and life coloration of each of the species included in this collection, with the synonymy of each, and a key by which these species may be distinguished. To species not included in this collection we make in general no reference.

In our descriptions of the species we have generally avoided the repetition of characters common to all, as well as those which are dependent on the age of the specimen and not upon specific difference. Most of the differences in form and proportions of the body belong to this latter class. Generally speaking, it is only the canine teeth, the scales of the head, the scales of the lateral line, the caudal fin, and the coloration which afford specific characters. The dorsal fin, the lower pharyngeals, and the isthmus afford generic distinctions, but are essentially similar in all the species of the same genus. In all the species the numbers are usually D. IX, 10. A. II, 9. Scales $2\frac{1}{2}$—24—6.

Three well-marked generic groups are represented in this collection. For these we should, in accordance with generally received laws of nomenclature, adopt the names *Scarus*, *Sparisoma*, and *Cryptotomus*. These correspond respectively to *Pseudoscarus*, *Scarus*, and *Calliodon* of Bleeker and Günther.

Of these genera, *Cryptotomus* approaches most nearly to the typical Labroids; *Sparisoma* is closely allied to it, while *Scarus* represents a considerable differentiation. Most writers, with Dr. Günther, have distinguished *Scarus* and *Sparisoma* chiefly by the number of rows of scales on the cheek, a character in itself of no systematic importance. On account of the trifling value of this character, several writers (Steindachner, Cope, Jordan, and Gilbert) have preferred to consider the groups thus defined as subgenera merely. An examination of many species leaves, however, no doubt that *Sparisoma* and *Scarus* are fully worthy of generic distinction, and, unless intermediate forms occur, *Cryptotomus* should be separated from *Sparisoma*.

ANALYSIS OF GENERA.

a. Lower pharyngeal spoon-shaped, much longer than broad; teeth of jaws fully coalesced; each jaw divided by a distinct median suture; gill-membranes forming a fold across the isthmus; dorsal spines flexible; lateral line interrupted, &c.; scales about head rather numerous, lower jaw included ..... SCARUS, A.

aa. Lower pharyngeals broader than long, flattish, or basin-shaped; gill membranes broadly joined to the isthmus, not forming a fold across it; lateral line subcontinuous; scales on head rather few.

b. Teeth chiefly coalescent, the jaws divided by a rather indistinct median suture; dorsal spines pungent; lower jaw projecting ..... SPARISOMA, B.

bb. Teeth coalescent laterally; the anterior chiefly separate; the median suture not evident; dorsal spines flexible ..... CRYPTOTOMUS, C.

A. Genus SCARUS.

SCARUS Forskål. Descr. Animal, &c., in Orient. Observ. 1775, 25 (*psittacus*, &c.).
CALLYODON Gronow. Museum Ichthyol., II, 8 (non-binomial).
CALLIODON Bloch & Schneider. Syst. Ichthyol., 1801, 312 (*lineatus=croicensis*).
HEMISTOMA Swainson. Class'n. Fishes, &c., 1839, II, 226 (*reticulatus* Sw.=*pepo* Bennett).
PETRONASON Swainson. Class'n, Fishes, &c., 1839, II, 226 (*psittacus*, &c.).
ERYCHTHYS Swainson. Class'n, Fishes, &c., 1839, II, 226 (*croicensis*, &c.).
CHLORURUS Swainson. Class'n, Fishes, &c., 1839, II, 227 (*gibbus*).
CALLYODON Gronow. Systema, Ed. Gray, 1854, 83 (*lineatus*, &c.).
PSEUDOSCARUS Bleeker. Versl. Akad. Wet. Amsterd., XII, 1861, Scaroid. 3 (*chlorodon*, *psittacus*, &c.).
PSEUDOSCARUS Günther. Poey, Guichenot et Auct.
SCARUS Jordan & Gilbert. Syn. Fish N. A., 1883, 938 (*psittacus, guacamaia*).

The name *Scarus* was used by the ancients and by some pre-Linnæan writers on zoölogy for the Mediterranean species of *Sparisoma*, *Labrus cretensis* L.

Its first use in any way as a generic name in binomial nomenclature is that of Forskål in 1775. The genus *Scarus* of Forskål was based on several species obtained by him on the coasts of Arabia. A few of these are not Scaroids. The others all belong to the group called *Pseudoscarus* by Bleeker. Forskål had apparently no acquaintance with the *Labrus cretensis*, and this species cannot in any proper sense be taken as the type of his genus. One of the species mentioned by him should be so taken, and as all his Scari belong to the same group, it makes no special difference which one is selected. Jordan & Gilbert have regarded *Scarus psittacus* Forskal as the type. If, however, *Sparisoma cretense* be taken as the type of *Scarus*, the proper name for the present genus would be *Calliodon*, and several of the useless generic names of Swainson have priority over *Pseudoscarus*.

The genus *Scarus* contains the majority of the species of this group. It is more widely distributed than the other genera; its species reach for the most part a larger size, and in general they are more brightly colored than the others.

ANALYSIS OF SPECIES OF SCARUS.

COMMON CHARACTERS.—Lower pharyngeals spoon-shaped, ovate-oblong, transversely concave: teeth in each jaw fully coalescent, appearing as tessellations on the surface; jaws with distinct median suture; edges of jaws even; upper pharyngeals each with two rows of teeth; gill-membranes scarcely united to the narrow isthmus, across which they form a broad fold; dorsal spines flexible, scarcely different from the soft rays; upper lip laterally double, the interior fold becoming very narrow or obsolete mesially; lower jaw included in the closed mouth; lateral line interrupted posteriorly, commencing again on the next series of scales below; tubes of lateral line scarcely branched; scales on cheek in two to four rows; scales in front of dorsal on median line 6 to 8. Species mostly of large size.

a. Teeth deep green; no canine teeth; cheeks with two rows of scales, those of the upper row larger than those of the second; one scale below the lower row; caudal subtruncate, the angles produced, especially in the adult. Olive green, with ill-defined green markings on head; lower parts more or less reddish; vertical fins brownish orange, all edged with deep blue. Size large. ..... GUACAMAIA, 1

aa. Teeth whitish or rosy.

b. Angle of mouth without canine.

c. Third row of scales of the cheek of one or two scales only; scales of the upper row much larger than those of the second row; caudal subtruncate, its outer rays more or less produced; adult with a fleshy hump above the snout; color bright blue, the young more or less shaded with reddish brown; fins mostly blue. Size large.....CŒRULEUS, 2

cc. Third row of scales of the cheek of three or four scales; scales of the upper row little larger than those of the second row; caudal slightly rounded, its outer rays not produced. Reddish, with three longitudinal blackish stripes, the second through eye to base of caudal; usually three whitish streaks on lower part of sides; fins chiefly orange.....CROICENSIS, 3

bb. Upper jaw with a posterior canine (rarely duplicated); cheeks with two and a half rows of scales; caudal subtruncate, its outer rays scarcely produced; head with two bluish green stripes, the interspaces reddish or yellow; general color bluish green, mixed with orange; dorsal and anal each with two green bands and one orange one.

d. Outer rays of caudal chiefly orange; yellow stripe above pectoral, below the level of the green stripes on head, which are nearly horizontal; orange stripe on dorsal and anal fins without blue spots.....VIRGINALIS, 4

dd. Outer rays of caudal deep greenish blue; yellow stripe above pectoral (if present), above the level of green stripes on head, which are somewhat oblique; orange stripe on dorsal and anal spotted or shaded with blue.....PUNCTULATUS, 5

1. Scarus guacamaia.

Guacamaia Parra, Descr. Dif. Piezas Hist. Nat., 1787, p. 54, pl. 26 (Cuba).

Scarus guacamaia Cuvier, Règne Animal, ed. ii, 1829, 265. (No descr.; based on Parra. Not *Scarus guacamaia* Cuv. & Val. = *Scarus pleianus* Poey.); Jordan & Gilbert, Syn. Fish. N. A., 1883, 938.

Pseudoscarus guacamaia Günther, iv, 233 (Jamaica, Puerto Cabello, Bahia); Poey, Synopsis Pisc. Cubens., 1868, 348, 463; Poey, Enumeratio Pisc. Cubens., 1875, 117.

Hemistoma guacamaia Jordan & Gilbert, Syn. Fish., N. A., 1883, 607 (Key West).

Head, 3 (3¼ in length to base of caudal); depth, 2⅜ (3⅔); length of example described (Key West), 7½ inches.

Body moderately elongate.

Jaws deep bluish-green, the color not fading in spirits; no canine teeth; upper lip covering more than half of surface of upper jaw.

Snout not very obtuse, 2⅔ in head; eye small, 6 in head; cheeks, with two rows of scales of five or six in each row, those of the upper row nearly twice as broad as those of the lower; a single scale below the lower row; six or seven scales on median line before dorsal.

Caudal rounded when spread open, its angles slightly produced, its outer rays (in specimens 8 inches long), ½ in head. In adults the outer rays are longer in proportion, and in very old examples, none of which were seen by us, they are said to be greatly produced.

Color in life, of specimens of moderate size, olive green, each scale edged with clear brown; its middle, especially above, bright verdigris green. Sides of head brownish-gray; belly white, tinged with brown;

a bright green stripe from eye around snout; another from eye to eye above; another undulating stripe below eye; several green spots and dashes behind eye; upper lip reddish; naked skin of middle of lower jaw green; teeth deep greenish-blue; vertical fins all brownish-red, verging on orange above; their edges, including sides and tip of caudal all bright greenish-blue; ventral flesh-color, tinged with orange, its anterior edge greenish-blue; pectoral very pale reddish, the first and last ray light blue; a greenish dot at the base of each membrane of dorsal and anal; axil reddish.

Older specimens are similar in color, but with the head more pinkish and its markings more diffuse. In spirits the green stripes and spots on head become fainter; the red of upper lip and axil and the orange of fins fade.

This species is abundant about rocks at Key West, and is also not uncommon in the Havana market, where it is known still as *Guacamaia*. Our fish appears to be the *Guacamaia* of Parra, on which, so far as the printed record shows, the *Scarus guacamaia* of Cuvier was based. The specimens in Cuvier's possession, afterwards decribed by Valenciennes under the name of *Scarus guacamaia*, have canines in the upper jaw, and apparently belong to a distinct and (to us) unknown species, to which Poey has given the name of *Scarus pleianus*. We have seen no specimens a yard in length, as mentioned by Parra, nor have we seen any with the caudal lobes prolonged to the extent shown in his figure.

None of our specimens, young or old, show traces of canines.

2. Scarus cœruleus.

Novacula cœrulea (the *Bluefish*). Catesby, Nat. Hist. Carolina, &c, 1743, 18, tab. 18 (Bahamas).

Loro Parra, Descr. Dif. Piezas Hist. Nat., 1787, 57, lam. 27, f. 1 (Cuba).

Trompa Parra, l. c. f. 2.

Coryphæna cœrulea Bloch, Ausländische Fische, ii, 120, taf. 176, 1783. (In part, after Catesby and a figure by Aubriet, altered from a figure by Plumier.) Gmelin, Syst. Nat., 1788, 1191 (copied).

Scarus cœruleus Bloch & Schneider, Systema Ichthyol., 1801, 288. (After Catesby, and Trompa of Parra.); Cuv. & Val. xiv, 186, 1839 (St. Thomas); Cuvier, Règne Animal, ed. II, 1829.

Pseudoscarus cœruleus Günther, iv, 1862, 227 (copied). Guichenot, Scaridés, Mus. Paris (Proc. Soc. Imp. Nat., Cherbourg), 1865, 24 (St. Thomas, San Domingo); Poey, Repertorio, i, 373, 1867; Poey, Synopsis, 1868, 348; Poey, Enumeratio, 1875, 117 (Cuba); Goode, Bull. U. S. Nat. Mus., v, 33, 1876 (Bermuda).

Scarus loro Bloch & Schneider, Systema Ichthyol., 1801, 288. (After *Loro* of Parra).

? *Scarus trilobatus* Lacépède, Hist. Nat. Poiss., iv, 1803, 21 (on a drawing by Plumier).

? *Sparus holocyaneos* Lacépède, Hist. Nat. Poiss., iv, 1803, 45 (on a copy by Aubriet of a drawing of Plumier; the copy colored entirely blue in order to represent this species; the original drawing probably intended for *Sparisoma chrysopterum;* the same copy by Aubriet, the original of Bloch's engraving of *Scarus cœruleus*).

2. **Scarus cœruleus**—Continued.

Scarus obtusus Poey, Memorias Cuba, ii, 1860, 217 (Cuba).

Pseudoscarus obtusus Poey, Synopsis, 349; Poey, Enumeratio, 117.

Scarus nuchalis Poey, Memorias, ii, 1860, 220 (Cuba).

Pseudoscarus nuchalis Poey, Synopsis, 348; Poey, Enumeratio, 117.

Pseudoscarus chloris Günther, iv, 1862, 227 (Jamaica; Excl. Syn.).

Pseudoscarus quadrispinosus Goode, Bull. U. S. Nat. Mus., v, 34. (Not *Scarus quadrispinosus* Cuv. & Val.)

Head, 3½ (3⅖); depth, 3⅕ 3⅖; length of example described (Havana), 10½ inches.

Body rather elongate.

Jaws whitish in the adult, rosy in the young; no canine teeth: upper lip covering about half of upper jaw.

Eye small, 5⅝ in head: snout rather acute, 2½ in head; cheeks with two rows of scales, the scales of the upper row nearly twice as broad as those of the lower; below the lower row is a partial row of two scales; six scales on median line of back before dorsal.

Caudal slightly rounded; when spread open its outer rays a little produced, 1⅓ in head, in young of a foot in length, said to be much longer in adult; color in life, of partly-grown specimens from Havana, bright sky-blue everywhere: some brown on upper scales; lower lip reddish brown, edged with blue; fins blue, with some brown; teeth pale reddish.

Color of young (4 inches), taken at Key West, light, livid blue-gray, tinged with brownish on back, quite bluish below; yellowish olive on top of head, but no sharp markings anywhere except on fins; jaws rather bright flesh-red, the snout bluish; teeth pale; dorsal edged with bright blue; below this dull orange; its base livid; caudal grayish; faintly banded with olive, its upper and lower edge bright blue; anal flesh-color, edged with light-blue; ventrals greenish-blue color fading on last rays; pectorals flesh-color, axil light blue.

Color in spirits greenish-olive above, pale below; dorsal dusky: caudal and anal grayish; fins otherwise pale.

This species is common in the Havana markets. A single young specimen was taken at Key West.

No specimens of more than a foot in length were obtained, and these show but slight traces of the fleshy hump on the snout, which is said to be very conspicuous in the adult fish. They correspond fairly to the *Loro* of Parra and to the *Scarus obtusus* of Poey. It is possible that these specimens are not the young of the large-humped *cæruleus*, but as no differences other than in the development of the hump and of the lobes of the caudal are to be found, we refer them, without much hesitation, to *S. cæruleus*. The same opinion is expressed by Günther, who considers his *chloris* as probably the young of *cæruleus*. His *chloris* is evidently our fish, though not the *chloris* of Bloch.

There is some confusion in regard to the original *Coryphæna cærulea* of Bloch, which must be regarded as in part only based on this species.

The *Scarus caeruleus* of Bloch & Schneider is, however, free from any confusion with *chrysopterum* or related species. *Scarus trilobatus* Lacépède is somewhat doubtful, and *Sparus holocyaneos* Lac. is involved in confusion with *Sparisoma chrysopterum*. The *obtusus* and *nuchalis* of Poey are probably forms of *caeruleus*. *Scarus quadrispinosus* C. & V. is evidently different, having two canines on each side of the upper jaw.

3. Scarus croicencis.

Callyodon Gronow, Museum Ichthyol., II, 8. 1763; Gronow, Zoöphylaceum, 244, t. 7, f. 4. (*Sine patria*).

Scarus croicensis Bloch, Ichthyol., taf. 221, about 1785. (St. Croix; probably more than one species included); Jordan & Gilbert, Syn. Fish., N. A., 1883, 938 (copied).

Erychthys croicensis Swainson, Nat. Hist., Class'n, Fishes, 1839, ii, 226 (name only).

Scarus insulæ-sanctæ-crucis, Bloch & Schneider., Systema Ichthyol., 1801, 285, (copied).

? *Calliodon lineatus*, Bloch & Schneider, Syst. Ichthyol., 1801, 312, pl. 62, f. 2, after Gronow); Gronow, Syst., ed. Gray, 1854, 84. (*Sine patria*).

Scarus alternans Cuv. & Val., iv, 1839, 200, (Martinique).

Pseudoscarus sanctæ-crucis Günther, iv, 226, 1862, (Jamaica; Trinidad; Puerto Cabello); Guichenot, Scaridés Mus. Paris, 1865, 29 (Martinique); Poey, Synopsis, 1868, 350, (Cuba); Poey, Enumeratio, 1875, 119.

Scarus sanctæ-crucis Cope, Trans. Am. Philos. Soc., 1870, 461, (St. Croix).

Pseudoscarus lineolatus, Poey, Repertorio, ii, 239, 1868, (Cuba); Poey, Synopsis, 350; Poey, Enumeratio, 1875, 119.

Head, 3 ($3\frac{5}{7}$); depth, 3 ($3\frac{5}{7}$); length of example described (Havana), 7 inches.

Body comparatively elongate.

Jaws reddish; no canine teeth; lip covering most of surface of upper jaw.

Eye small, $5\frac{1}{4}$ in head; snout not obtuse, $2\frac{3}{4}$; cheeks with three rows of scales, the lower with three or four scales, those of the upper row scarcely larger than those of the second row; seven scales on median line before dorsal; caudal slightly and evenly rounded, its outer rays $1\frac{1}{2}$ in head. Not at all produced in specimens examined.

Color in life, of young of 2 to 4 inches, dark-olive, little mottled, rosy below, on bases of scales and lower part of head; two dark, lateral, parallel stripes, the upper passing through eye and about equaling it in width, being twice as wide as lower stripe, which meets base of pectoral; teeth light-reddish; dorsal orange yellow, its edge pale bluish; caudal and anal similar, the former mottled; ventrals red-orange; pectorals plain, the base yellowish without dark blotch.

In spirits the rosy color becomes grayish, and all the fins pale.

Older specimens, 7 to 9 inches in length, are dark, reddish-brown above, paler below; back dark, sides with two dark parallel stripes of the color of the back, separated by pale interspaces, the upper one backward from eye; snout above bluish-brown, a narrow whitish streak running from head along the middle line of belly; three similar

streaks on each side of breast, there being one on each row of scales; teeth dark red; a dusky blotch at base of pectoral; caudal pale, orange-red, with dusky on tip and sides, the outer rays being somewhat barred with brown; anal light bluish-dusky, paler in front and on edge; ventrals and pectorals pale; dorsal orange, edged with bluish.

Several young specimens of this species were taken at Key West. In Havana it is rather common, and is known as *Bullon*.

It seems never to reach a large size. Goode has suggested that it is perhaps the young of *Scarus vetula* (= *superbus* Poey), but we are very positive that this cannot be the case. The two are very unlike in dentition as well as in color.

There is no warrant for the change of the original name, *croicensis*, into *sanctæ-crucis*, and we have, as a matter of course, restored the original form of the word.

The *Calliodon lineatus* seems to us, as suggested by Valenciennes, as probably this species.

Poey recognizes *Pseudoscarus lineolatus* with the three streaks along the side of the breast, as shown by our specimens, and *P. sanctæ-crucis*, in which these markings are obsolete.

In the absence of other characters, we cannot regard such a color-mark as probably indicating specific distinction.

4. Scarus virginalis, sp. nov.

Scarus vetula Cuv. & Val., xiv., 193, 1839 (St. Thomas; not of Bloch & Schneider, based on a figure of Parra, representing *Scarus superbus* Poey).

Pseudoscarus psittacus Günther iv, 225, 1862 (Cuba; Jamaica; after *Coryphæna psittacus* L., which is a species of *Xyrichthys;* not *Scarus psittacus* Forskål, an Asiatic species); Guichenot, Scaridés Mus. Paris, 1865, 25 (Martinique; St. Lucia); Poey, Synopsis, 347 (Cuba); Poey, Enumeratio, 116.

Scarus psittacus Cope, Trans. Am. Philos. Soc., 1871, 461 (St. Martins; St. Croix).

Head, 3 ($3\frac{2}{3}$); depth, $2\frac{2}{3}$ ($3\frac{1}{3}$); length of the typical example (Havana), $9\frac{1}{2}$ inches.

Body oblong-elliptical.

Jaws pale; a canine directed backward and outward above the angle of the mouth; upper lip covering more than half of surface of upper jaw.

Eye small, 6 in head; snout rather acute, $2\frac{2}{3}$ in head; cheek with two nearly equal rows of about six scales each; one or two large scales below the lower series; eight scales on median line of back before dorsal.

Caudal fin when spread open very slightly rounded; the outer rays very slightly produced, $1\frac{2}{3}$ in head, in specimens of 9 inches.

Color in life dark orange-brown above; the centers of each scale greenish-blue; rather abruptly paler below, where the blue predominates as it does also on caudal peduncle; sides of head with two hori-

zontal stripes of deep bluish-green, running from angle of opercle through eye and meeting around snout, the interspace anteriorly yellowish, posteriorly brownish; head light-greenish below; two green stripes, with a yellowish interspace on lower jaw; a broad, bright yellow band *below* level of green stripes of head, running from base of pectorals backward nearly to middle of body.

Dorsal fin greenish-blue on lower half; above this a broad orange band, the fin margined with sky-blue; caudal indigo-bluish, with some vague yellow shades; the outer rays bright orange, edged with indigo-bluish; anal greenish, blue at base, then a rather narrow stripe of orange, the outer half of the fin bluish; ventrals greenish and yellowish; pectoral light yellow, no dark blotch at its base.

In spirits the orange fades to yellowish and the blue to bright green. The yellow lateral band is in spirits dashed with red.

This beautiful species is not uncommon at Havana, where several specimens were obtained.

The name *psittacus* has been used by recent writers for this species. The original type of *Coryphæna psittacus*, sent by Dr. Garden from Charleston, is still preserved by the Linnæan Society of London. It has been examined by Dr. Bean, who has found it to be a *Xyrichthys*.

There seems to be also no doubt that the orginal *Vieja* (pl. 28, f. 1), of Parra, on which the *Scarus vetula* of Bloch & Schneider is based, is identical with the *Scarus superbus* of Poey, rather than with the present species, to which it has been referred by Cuvier & Valenciennes. The name *vetula* must therefore supersede *superbus*, as already noticed by Mr. Goode. (Bull., U. S. Nat. Mus., v, 32.) As described by Dr. Günther, *Scarus vetula* (*superbus*) differs from the present species in the number of scales on the cheek, in dentition, and in coloration, although in the latter respect the two have much in common. As neither *vetula* nor *psittacus* are available as specific names for the present species, we propose for it the new name of *Scarus virginalis*.

5. **Scarus punctulatus.**

Scarus punctulatus Cuv. & Val , xiv, 1839, 195 (Martinique).

Pseudoscarus punctulatus Guichenot, Scaridés Mus. Paris, 1865, 26 (Martinique).

Pseudoscarus tæniopterus Günther, iv, 226 (Trinidad; excellent description; not of Desmarest ?).

Pseudoscarus diadema Poey, Synopsis, 347; Poey, Enumeratio, 116 (not *Scarus diadema* C. & V., nor of Cope).

? ? *Scarus tæniopterus* Desmarest, Dict. Classique, xv, 244, pl. 12, 1831 (Cuba); ? ? Cuv. & Val., xiv, 195 (same type).

? ? *Pseudoscarus tæniopterus* Guichenot, Scaridés Mus. Paris, 1865, 26 (same specimen).

Head, $3\frac{1}{4}$ ($3\frac{2}{3}$); depth, $3\frac{1}{3}$ ($3\frac{5}{6}$); length of specimen described (Havana), 6 inches.

Body oblong-elliptical.

Jaws whitish; a canine directed outward above angle of mouth on

each side; a second small canine present on one side in the specimen described; upper lip covering about half of surface of upper jaw.

Eye small, $5\frac{1}{4}$ in head; snout rather acute, $2\frac{2}{3}$ in head; cheek with two rows of scales, those of the upper row being about one-third larger than those of the second row; two scales below the lower series; seven scales before dorsal.

Caudal fin truncate or slightly rounded when spread open, the angles not produced; (in specimen of 6 inches) the outer rays $1\frac{3}{4}$ in head.

In life orange-brown; the centers of most of the scales bright bluish-green, these blotches large, so that the green predominates over the orange on most of the body. On the anterior part of the back and on top of head there is little green, this region being more brown.

A light-yellow longitudinal band, higher up than the similar band in *S. retula*, and above the level of the green stripes on head, running backward from upper part of gill-opening nearly to end of pectoral; below this is a dark, grayish band about as broad as eye, extending about to end of pectorals: this is bordered above and below by bright green. These green stripes become very distinct on the head, where they extend forward on snout, one above and one below the eye, the lower meeting its fellow on the upper lip, the upper on the forehead; interspace between these bands dark gray; a grass-green band around lower jaw; lower half of head light yellowish-green; belly pale-greenish; dorsal and anal bright green at base and tip, mesially orange, the orange with a median more or less interrupted band of blue, the corresponding band on anal forming a row of spots; caudal bright greenish-blue, the outer rays entirely blue, the inner with their membranes orange; pectoral pale yellow; the axil not dusky.

This species is very close to the preceding, differing so far as we can see only in the arrangement of the colors.

But a single specimen was obtained. This answers almost exactly to Guichenot's description of the type of *Scarus punctulatus* and to Gunther's *Pseudoscarus tæniopterus*.

Scarus diadema C. & V. appears to be somewhat different, as also *Scarus tæniopterus* Desmarest. It is possible, however, that the type of the latter is faded and has lost the markings of the head. In that case the appropriate name of *tæniopterus* should supersede *punctulatus*. At present this identification is too doubtful to justify this change of name.

B. Genus SPARISOMA.

SCARUS, sp. Auct.
SPARISOMA Swainson, Nat. Hist. Class'n, Fishes, &c., 1839, ii, 227 (*abildgaardi*).
SCARUS Bleeker, Versl. Akad. Wet. Amsterdam, xii, 1861, Scaroid, 3 (*cretensis*).
SCARUS Günther, Poey, Guichenot, et auct. (*cretensis*).
SPARISOMA Jordan & Gilbert, Syn. Fish. N. A., 1883, 938 (*abildgaardi*).

We have elsewhere given the reasons which have led us to retain the name *Scarus* for the group (*Pseudoscarus*) to which the species originally described by Forskål belong.

This being done the only name applicable to the present group is that of *Sparisoma* Swainson. As originally defined this generic name was a wanton synonym like nearly all the other generic names of fishes proposed by Swainson. It is supposed to differ from the *Petronason* of the same author in the presence of hexagonal scales, sharp incisive teeth, and obtuse canines. As, however, its type, *S. abildgaardi*, is a member of the present genus, the name should not be set aside.

ANALYSIS OF SPECIES OF SPARISOMA.

COMMON CHARACTERS.—Lower pharyngeal broader than long, subhexagonal, its surface moderately concave or flattish; teeth in each jaw largely coalescent in the adult, their tips more or less separate in the young, the edge, especially of the lower jaw, remaining uneven; the median suture in each jaw present, but not well defined; one to four radiating canines sometimes present on each side of upper jaw above its cutting edge;* gill-membranes broadly united to the isthmus; dorsal spines pungent; upper lip double for its entire length; lower jaw projecting beyond upper; lateral line not interrupted, passing gradually from its row of scales posteriorly to the one next below it; tubes of lateral line much branched; scales about head large, those on cheek in a single row, those on the median line in front of dorsal 3 or 4 in number. Species of rather small size, most of them American.

a. Upper jaw without canines; caudal lunate in adult, subtruncate or mesially rounded in the young; head without bright stripe.

b. Caudal fin with obscure bars and spots, its general color pale orange; no distinct green or blue anywhere; body olivaceous, much clouded, and washed with cherry red; lower fins mostly red; pectorals light orange; axillary spot usually distinct ..... FLAVESCENS, 6.

bb. Caudal fin without bars or spots, its outer rays green, its inner ones red; some greenish-blue on head; axillary spot very distinct; body olivaceous, nearly plain, yellowish below ..... FRONDOSUM, 7.

aa. Upper jaw with one or more canines above its cutting edge.

c. Caudal fin deeply lunate, the upper lobe about as long as head and twice or more length of inner rays.

d. Canines 3 or 4 on each side; pores of lateral line excessively branched, each with several (6 to 8) much divided branches; color bright greenish-blue (the side sometimes with a blue band); caudal lobes blue, the middle rays red; dorsal and anal red; pectorals yellowish, the axillary spot large, black, edged with red .. CHRYSOPTERUM, 8.

dd. Canines 1 or 2 on each side; pores of lateral line each with few (4 or 5) nearly simple branches; color in life chiefly light blue, without sharp markings, this color becoming reddish in spirits; caudal lobes dull greenish; the middle rays reddish; other fins mostly scarlet; axillary spot well defined ..... LORITO, 9.

cc. Caudal fin lunate, the outer rays exserted, but not twice as long as the inner rays and much shorter than the head; canine single on each side (rarely obsolete or duplicated).

e. Head with a scarlet stripe from below eye to angle of mouth; a small scarlet streak behind eye; color chiefly purplish-brown; a round spot of yellow and black behind head, just below lateral line; fins chiefly red; angles of caudal black; axillary spot obscure.

AUROFRENATUM, 10.

* In species normally possessing a single canine on each side (*aurofrenatum*; *abildgaardi*) it is occasionally absent on one or both sides, and sometimes specimens are found with one more than the normal number on one or both sides. We find no evidence that the disappearance of the canines is a matter of age, although in all species the edges of the jaw are less uneven in the adult.

ee. Head unstriped; color dark reddish-brown, with whitish mottlings; belly and fins mostly cherry red; axillary spot obsolete.

ABILDGAARDI, 11.

eee. Caudal fin subtruncate, the angles rounded, the outer rays not longer than the median ones; canines 2 to 4 on each side, the anterior pair near the median suture of upper jaw (perhaps obsolete with age); size small.

f. Canines usually 2 to 3 (on different sides); color, olive-green, much mottled, reddish below; edge of opercle, axillary region and a blotch on base of pectoral deep greenish-blue; upper fins olivaceous; anal and caudal without black; axil without black ..... CYANOLENE, 12.

ff. Canines usually 3 to 4 (on different sides); color, olive-green above, mottled and speckled with red; snout with blue lines; axil and base of pectoral black; fins mostly light orange and yellow, the anal and caudal in the adult largely black ..... XYSTRODON, 13.

6. Sparisoma flavescens.

Vieja Parra, Descr. Dif. Piezas Hist. Nat. 1787, 59, pl. 28, f. 4 (Cuba).

Scarus flavescens Bloch & Schneider, Syst. Ichth., 1801, 290 (after Parra); Poey, Enumeratio, 1875, 113 (identification of *Sc. squalidus* with Parra's figure.

Callyodon flavescens Cuv. & Val., xiv, 289, 1839 (after Parra).

Scarus rubripinnis Cuv. & Val., xiv, 199, 1839 (San Domingo); Günther, iv, 211 (copied); Guichenot, Scaridés Mus. Paris, 13; (copied), ? Cope, Trans. Am. Phil. Soc., 1871, 462 (St. Croix).

? *Scarus virens* Cuv. & Val. xiv, 203, 1839. (Porto Rico; Martinique).

Scarus squalidus Poey, Memorias, ii, 218, 1860 (Cuba); Poey, Synopsis, 338; Jordan & Gilbert, Syn. Fish., N. A., 1883, 938 (Garden Key); Günther iv, 212, 1862 (copied).

? *Scarus chloris* Guichenot, Scaridés Mus. Paris, 1865, 14 (San Domingo, type of *Scarus virens;* not of Bloch & Schneider).

? *Scarus truncatus* Poey, Synopsis, 1868, 339; ? Poey, Enumeratio, 1875, 114.

Head, 3½ (4⅓); depth, 2⅔ (3½); length of the specimen described (Key West), 7½ inches; body oblong; jaws pale in color; no canine teeth; upper lip covering most of upper jaw; eye rather small, 4⅓ in head; snout bluntish, 2⅔; cheek with a single series of about five large scales; tubes of lateral line dividing into about five branches, covering most of the scale; four scales on median line before dorsal.

Caudal fin slightly lunate, the upper lobe longer and narrower than the lower, 1⅓ in head; the prolongation of the outer rays varies somewhat and is greatest in adult examples; the concavity of the fin is evident in specimens 3 inches long, but in the very young the fin is truncate, or even slightly convex. A few specimens of 6 to 8 inches are in the collection in which the caudal fin appears fairly truncate when spread open, the angles remaining acute. In most cases, however, the fin is slightly concave.

The caudal fin has essentially the same form in *Sparisoma frondosum*, *flavescens*, *abildgaardi* and *aurofrenatum*. In the other species mentioned in this paper it is materially different.

Color of adult in life olivaceous, somewhat clouded with light and dark, and usually flushed with pinkish especially below, the edges of the scales more yellow olive; scales of belly and lower parts light orange-

red towards their bases, giving a decidedly reddish cast; dorsal mottled with different shades of olive; caudal creamy, mottled and barred with darker orange, the markings more distinct on the outer edge; ventrals and anal rich cherry red, mottled or barred with brown; pectorals light orange-red, the color formed by narrow orange cross-streaks on a paler ground; a light band across lower jaw, which is otherwise brown; teeth white; a dusky or black bloch at base of pectoral. Sometimes blackish spots on the scales at the base of soft dorsal. In spirits the red of body and fins and yellow on scales become pale.

Young specimens have small, bright, rosy spots on sides of back; two faint darker longitudinal shades along sides.

This species is excessively common at Key West, swarming everywhere about the island, in the eel-grass. It rarely exceeds a foot in length. At Havana it is apparently equally common, the numbers seen in the market exceeding that of all the other species combined. It is the least brightly colored of the species mentioned in this paper. As a food fish this, like the others, is held in low esteem. The flesh, although not unpleasant in flavor, is soft and rather poor. In the Havana market it is usually called *Vieja colorada*, but the species of this group are seldom distinguished by fishermen.

We follow Poey in identifying with this species the *Vieja* of Parra, which is made the type of *Scarus flavescens* of Schneider. Valenciennes has made of this "Vieja," a *Calliodon*, and Bleeker a *Callyodontichthys*. Parra's figure seems not unlike this species, but we should not have ventured so to consider it except for the authority of Poey. There seems to be little doubt that this species is the original *Scarus rubripinnis* as well as the *Scarus squalidus* of Poey. The *Scarus virens* C. & V., and *Scarus truncatus* of Poey either belong to this species or to some one very closely related to it, perhaps distinguished by a truncate caudal.

If the name *flavescens* is considered too uncertain for adoption, the much more appropriate *Sparisoma rubripinne* comes next in order of time.

There is considerable variation in the amount of redness in this species, large ones being usually more rosy than the young.

7. Sparisoma frondosum.

Scarus frondosus Cuv. & Val. xiv, 204, 1839 (Brazil); Guichenot, Scaridés, Mus. Paris, 1865, 15 (Bahia) (not of Günther = *Scarus distinctus* Poey).

Scarus brachialis (misprinted *bragnialis*) Poey, Memorias, II, 345, 1861 (Cuba); Poey, Synopsis; 337, Poey, Enumeratio, 113.

Head, $3\frac{1}{5}$ (4); depth, $2\frac{2}{5}$ ($3\frac{1}{7}$); length of example described (Havana), $7\frac{1}{2}$ inches.

Body moderately deep.

Jaws pale. No canine teeth. Upper lip covering most of upper jaw.

Eye rather large, $4\frac{1}{2}$ in head; snout rather acute, 3; cheeks with a single row of about four large scales. Each pore of lateral line with

four to seven branches, which cover most of the scale. Four scales on median line before dorsal.

Caudal fin moderately lunate, the middle part a little convex when the fin is spread open; the outer rays moderately produced; the upper lobe $1\frac{2}{5}$ in head.

Color in spirits dark olive green above, somewhat mottled; paler below. A faint greenish streak running backward from angle of mouth. No distinct spots or stripes on body. Teeth pale. Dorsal dusky gray. Caudal pale, immaculate, the outer rays above and below green. Anal dusky gray, somewhat mottled. Ventrals and pectorals pale, slightly greenish; a distinct dark blotch at base of upper rays of pectoral; the axil pale.

A single specimen of this species was obtained at Havana. Its life colors were not noticed. In spirits its colors are quite different from those of *S. flavescens*, though in other respects the two bear much resemblance.

Our specimen agrees equally well with the descriptions of *frondosus* and *brachialis*. We conclude, therefore, that the two are identical. The *frondosus* of Günther is evidently not the same, and Poey is probably right in identifying it with his *Scarus distinctus*.

8. Sparisoma chrysopterum.

Vieja Parra, Descr., Dif., Piezas Hist. Nat. 1787, 58, pl. 28, f.4. (Cuba.)

Scarus chrysopterus Bloch & Schneider. Syst. Ichth., 1801, 286, pl. 57 (American seas); Cuv. & Val., xiv, 185, 1839 (St. Thomas); Günther, 1862, 12, (Martinique; Jamaica), Guichenot, Scaridés Mus. Paris, 12, 1865 (San Domingo; Guadeloupe); Cope, Trans. Am. Philos. Soc., 1871, 462 (St. Croix; St. Kitts).

Scarus chloris Bloch & Schneider. Syst. Ichth., 1801, 289 (after Parra); Goode, Bull. U. S. Nat. Mus., v. 1876, 34, (synonymy).

Scarus lateralis Poey, Memorias II, 219, 1860 (Cuba); Poey, Repertorio, I, 373, 375; II, 162; Poey, synopsis, 337; Poey, Enumeratio, 112.

Head, $3\frac{1}{4}$ ($4\frac{1}{4}$); depth, $2\frac{5}{7}$ ($3\frac{4}{5}$); length of the example described (Havana), 13 inches.

Body oblong.

Jaws pale. A strong canine directed outward and backward toward angle of mouth in upper jaw; besides this about three smaller canines toward the front of the jaw; most of these turned forward. Upper lip covering about half of upper jaw.

Eye $5\frac{2}{3}$ in head; snout not obtuse, $2\frac{3}{4}$; cheek with a single row of three or four large scales. Each pore of lateral line ramose, many times forked and covering most of the scale; the pores more branched than in any other of our species. Four scales on median line before dorsal.

Caudal deeply lunate. The outer rays much produced. The upper lobe longest, twice as long as inner rays, as long as head.

Color in life bright blue, almost everywhere tinged with green. Dorsal and anal and middle of caudal brick red; edge of caudal blue.

Ventrals bluish green. Pectoral greenish yellow; its base red around a large black spot.

In spirits the blue is more or less faded, leaving the fish chiefly green, darker on head. The red and yellow of fins become pale grayish.

According to Poey there is usually a dark blue horizontal stripe along sides behind pectoral fin.

A single rather large specimen was obtained in the Havana market.

There has been no disagreement among recent writers as to the synonymy of this species. Goode, in adopting for it the name *chloris*, has overlooked the slight priority of *chrysopterum*, and Poey has preferred to set both aside on account of imperfections in the description and of the error involved in the name of *chrysopterum*, none of the fins being really golden.

The identification of Parra's figure has been rendered certain by a colored drawing of the original type of Parra, sent by Graëlls to Poey, and by him presented to the present writer.

The original figure of this species, published by Bloch & Schneider, is atrocious as to form, but not uncharacteristic as to color or dentition. It may have been made from a dried and distorted skin.

9. **Sparisoma lorito**, sp. nov.

Head, $3\frac{1}{3}$ (4); depth, $2\frac{5}{6}$ ($3\frac{4}{5}$); length of typical example (Havana), 10 inches.

Body oblong, moderately deep.

Jaws pale; one or two small canines on each side, directed outward and backward, in front of the angle of the mouth, one on one side, two on the other, in the typical specimen; upper lip covering more than half of upper jaw.

Eye rather large, $4\frac{2}{3}$ in head; snout rather acute, $2\frac{2}{3}$; cheeks with a single row of large scales. Pores of lateral line less branched than usual in this genus, not covering nearly the whole surface of the scale; those on the caudal peduncle most branched; those of the anterior region mostly once or twice forked. Four scales on median line before dorsal.

Caudal fin deeply lunate, the outer rays much produced, the upper lobe slightly the longer, nearly twice as long as inner rays and nearly as long as head.

Color in life pearly blue, the color mixed with greenish and gray; teeth pale; dorsal reddish, tinged with gray; lobes of caudal greenish-gray, washed with brown; center of fin reddish; posterior margin grayish; anal rather dull scarlet mixed with gray; ventrals pinkish; pectorals light yellowish-olive, a large black blotch at base above; color in spirits brownish-olive in dorsal region, grayish-olive mixed with crimson on sides, and light-green below; head greenish, purplish on cheeks, light-green below; lips green; dorsal and anal orange; the rays grayish-dusky; caudal pale orange, the outer rays greenish; the

posterior margin of fin dusky; ventrals flesh-color, tinged with pinkish; pectorals orange-olive, the base of upper rays with a dark spot, its axil pale.

A single adult specimen taken at Havana.

This species is related to *S. chrysopterum*, differing in the presence of but a single canine, in the less branched pores of the lateral line, and in the coloration. We are not able to identify it with any of Poey's species. The name *Lorito* is a diminutive of *Loro*, parrott, the name generally given to the blue *Scari* by the Cuban fishermen.

10. Sparisoma aurofrenatum.

Scarus aurofrenatus, Cuv. & Val., xiv, 1839, 191 (San Domingo); Günther, iv, 212 (Cuba, Jamaica, Trinidad); Guichenot, Scaridés Mus. Paris, 1865, 13 (San Domingo); Cope, Trans. Am. Philos. Soc., 1871, 46 (St. Croix; St. Martins).

Scarus miniofrenatus Poey, Memorias, II, 279, 393, 1860 (Cuba); Poey, Repertorio, I, 1867, 374; II, 164, 1868; Poey, Synopsis, 337; Poey, Enumeratio, 1875, 111.

Head, 3¼ (4); depth, 2⅞ (3½); length of example described (Havana), 8½ inches.

Body elliptical-oblong.

Jaws pale in color; teeth less distinct than usual in this type, the edge of the upper jaw nearly entire, the edge of the lower jaw more uneven. A small canine in front of the angle of the mouth on each side (this obsolete on both sides of one of the three specimens examined). A small canine near suture of upper jaw on both sides usually present; upper lip covering more than half of upper jaw.

Eye rather large, 4⅜ in head; snout not blunt, 1⅔ in head; cheeks with a single row of 4 or 5 large scales; four scales on median line before dorsal; pores of lateral line much branched, covering most of the scales.

Caudal fin moderately lunate, the upper lobe the longer, 1⅔ in head, 1⅓ times length of middle rays.

Color in life purplish brown, becoming reddish on sides, and finally livid greenish below; head purplish-violet about eyes; side of head with a stripe of vivid scarlet running from corner of mouth just below and slightly past eye, a second short streak of the same color above the first behind eye; a golden-orange spot rather smaller than eye on and below the fifth scale of the lateral line, its upper portion black; dorsal orange, slaty at base, posteriorly; caudal, scarlet at base, then blood red, yellowish in the center, whitish behind, the projecting tips of both lobes black, the whole fin faintly mottled and barred with dusky; anal crimson, its edge light blue; ventrals livid purplish; pectorals light yellowish, bluish in axil, dusky at base in front. In spirits the orange and red colors fade to light yellowish. A more or less distinct dark stripe on each row of scales below the lateral line, paler on lower rows; pale greenish about eyes; dusky on snout above; edge of scales on body above, and on sides more or less dusky.

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This species is rather common at Havana, where three specimens were obtained. In color it is one of the most strongly marked and handsomest species. The name *aurofrenatum* is rather unfortunate, as the stripe on the head is bright vermilion in life. This, however, does not justify us in the substitution for *aurofrenatum* of the name *miniofrenatus* of Poey.

11. Sparisoma abildgaardi.

Vieja Parra, Descr. Dif. Piezas Hist. Nat., 1787, 58, pl. 28, f. 2 (Cuba).

Sparus abildgaardi Bloch, Ichthyol., taf. 259, about 1790 ("America," from a specimen sent by Professor Abildgaard); Lacépède, Hist. Nat. Poiss., iv, 55, 163, 1802 (copied).

Scarus abildgaardi Cuv. & Val., xiv, 175, 1839 (St. Thomas; Bahia); Günther, iv, 209 (Puerto Cabello); Guichenot, Scaridés, Mus. Paris, 10 (Bahia; San Domingo); Poey, Repertorio I, 371, 1867, II, 160; Poey, Synopsis, 337; Poey, Enumeratio, 111; Cope, Trans. Am. Philos. Soc., 1871, 461 (St. Croix; St. Martins).

Sparisoma abildgaardi Swainson, Nat. Hist. Class'n, Fishes, &c., II, 1839, 227.

Scarus coccineus Bloch & Schneider, Syst. Ichthyol., 1801, 289 (after Parra); Cuvier, Règne Animal, 1829, ed. II.

Sparus aureoruber Lacépède, Hist. Nat. Poiss., iv, 55, 163, 1803 (on a drawing by Plumier).

Scarus amplus Ranzani, "Nov. Comm. Acad. Scient. Inst. Bonon., t. 5, p. 324, pl. xxv, 1842" (*fide* Guichenot).

Scarus erythrinoides Guichenot, Scaridés, Mus. Paris, 10, 1865 (San Domingo).

Scarus oxybrachius Poey, Synopsis, 1868, 342 (Cuba); Poey, Enumeratio, 115, lam. 14, f. 2.

Head, $3\frac{1}{5}$ ($3\frac{5}{7}$); depth, $2\frac{5}{7}$ ($3\frac{1}{2}$); length of example described (Havana), 8 inches.

Body rather deep. Jaws pale; a small, bluntish canine on each side of upper jaw in front of angle of mouth; upper lip covering most of upper jaw.

Eye rather large, $4\frac{1}{2}$ in head; snout rather acute, $2\frac{5}{7}$; cheeks with a single row of large scales; each pore of lateral line with 5 to 8 branches covering most of the scale; four scales on median line before dorsal.

Caudal fin slightly lunate; the middle a little convex when spread open; the outer rays slightly produced; the upper rays $1\frac{1}{2}$ in head in the largest specimens examined.

Color in spirits almost plain dark brown, somewhat mottled with paler; a few dark dots on opercle, the edge of the opercle being more or less blackish; pale gray below, from tip of lower jaw to caudal; teeth pale, tinged with reddish; all the fins pale, the dorsal narrowly edged with dusky, the fin somewhat mottled with darker; axil of pectoral pale, the base dusky above.

In life the dorsal, caudal, lower fins, and belly are bright cherry-red; rest of body brown, tinged with red; pale dots and mottlings on sides of head and on body.

Several specimens of this species were obtained at Havana, where it is not uncommon.

We suppose this to be the original *Sparus abildgaardi* of Bloch, although none of the earlier descriptions are good or even accurate. The *Scarus coccineus* of Bloch & Schneider seems to belong certainly here. The description given by Guichenot of his *Scarus erythrinoides* fits our specimens well: better than his account of *Scarus abildgaardi*. We do not see that Poey's *Scarus oxybrachius* can be different. The sharpness of the pectoral is probably merely accidental. The pectoral is a little longer in proportion to the head in this species than in most others, but this difference seems to be due to the fact that the head is rather shorter.

The description of *Scarus amplus* we have not seen.

12. Sparisoma cyanolene, sp. nov.

Head, 3 ($3\frac{3}{4}$); depth, $2\frac{7}{1}$ ($3\frac{2}{5}$); length of specimen described (Key West), $5\frac{1}{2}$ inches.

Body oblong.

Jaws pale; a single stout canine directed outward and usually slightly backward on each side of upper jaw, in front of angle of mouth; a second canine often present in front of this; a small canine directed downward on each side in front of upper jaw above the cutting edge and close to the median suture; upper lip covering most of upper jaw.

Eye moderate, $4\frac{1}{2}$ in head; snout rather obtuse, 3; cheek with one row of large scales; pores of lateral line each with 4 to 6 branches, which cover nearly the whole of the scale; four scales on median line before dorsal.

Caudal slightly convex when spread open, the outer rays scarcely as long as the median ones, $1\frac{1}{2}$ in head.

Lower pharyngeal nearly twice as broad as long; its upper surface almost flat, less concave than in related species.

Color in life on upper half of body olive-green, the color very much mottled and specked, marbled with whitish and streaked with green; lower parts fleshy-red, equally and similarly mottled; top and front of head most extensively mottled; sides of head similarly mottled; lower jaw usually more or less brown, with two whitish bands, the anterior continuous, the posterior of four separate whitish blotches; edge of operele bright greenish-blue; axil extensively deep blue, with some reddish spots; a deep blue blotch on base of pectoral; dorsal colored like the back; caudal greenish at base, with a pale yellowish band and some small whitish dots; its edge blackish, the fin elsewhere translucent; anal dull gray with orange, mottled with brown; ventrals pale flesh color.

The yellow and orange of fins and red of belly become grayish in spirits. The blue of the axil becomes dark green in spirits, but does not disappear.

This little fish is very abundant about Key West, where many specimens were taken with the seine in the kelp. None of these were more than 6 inches in length, and as they were sexually mature at that size it is not likely that they grow much larger.

The species does not appear to have been previously described. The prevalence of blue around the base of the pectoral is a striking color mark and has suggested the specific name. This blue does not disappear in alcohol.

This species was not obtained at Havana.

13. Sparisoma xystrodon, sp. nov.

Head, 3($3\frac{5}{7}$); depth, $3\frac{5}{7}$; length of an example from Key West, $4\frac{3}{4}$ inches.

Body oblong.

Jaws pale; upper jaw with three or four exserted canines on each side above the cutting edge, the largest in front of the angle of the mouth, curved outward and somewhat backward; the others farther forward, one of them being near the median suture; upper lip covering most of upper jaw.

Eye moderate, $4\frac{1}{2}$ in head; snout bluntish, $2\frac{4}{5}$; cheek with one row of 4 or 5 scales; pores of lateral line, each with 3 to 6 branches, covering most of the scale; four scales before dorsal.

Caudal fin slightly convex when spread open; its outer rays scarcely as long as middle ones, $1\frac{1}{2}$ in head.

Color in life bright olive-green above, paler below; the upper parts very much mottled, speckled with white and marbled with coppery-red on various scales. Head similarly green, dotted with whitish above, a narrow ring of bright blue above eye, interrupted above; a blue stripe from it straight to angle of mouth; blue and coppery markings on opercle; lower parts of head light yellow; a blue band around lower jaw; axil and a spot at base of pectoral in front above deep blue-black; dorsal orange flesh-color, its tip paler; caudal yellow at base, paler beyond, its posterior portion more or less jet black; the fin with a few whitish dots toward the base; anal light bluish and reddish, its tip dusky; ventrals pale; pectorals light yellowish; lining of opercle blackish.

Other specimens having the same markings were pearly-bluish rather than green above, livid below; the blue on head paler, the red of a light yellowish-carmine. Some highly-colored specimens are greener, with belly bright yellow, brightest at throat; anal and caudal chiefly jet black.

In spirits this species is dark olive-green above, paler below; caudal and anal very broadly margined with black. Black bar across base of pectoral very distinct. The amount of black on caudal and anal seems to depend on age, the very young showing scarcely any.

This species is found in the eel-grass and Fucus about Key West, in

company with *S. cyanolene*, and it is equally abundant with the latter. It reaches a still smaller size, none of the many specimens obtained exceeding 5 inches in length. These are sexually mature.

This species is closely allied to several (*radians*, *lacrimosum*, *atomarium*, *hoplomystax*) found in the West Indies, but we think it distinct from all of these.

One or two specimens thought to belong to this species were seen in the market at Havana.

C. Genus CRYPTOTMUS.

CALLIODON Cuvier, Règne Animal, 1829, ed. II. (*spinidens*) (not of Gronow, nor of Bloch & Schneider.)

CALLYODON Cuvier & Valenciennes, Günther, Guichenot, Poey, Stiendachner, Jordan & Gilbert.

CRYPTOTOMUS Cope, Trans. Am. Phil. Soc., 1871, 462, (*roseus*).

This genus is closely related to *Sparisoma*, differing from it in having the anterior teeth nearly separate at all ages and in having the dorsal spines flexible as in *Scarus*. The dentition approaches that of a very young *Sparisoma*.

The genus *Calliodon* of Gronow and of Bloch & Schneider was based on a species which apparently belongs to the genus *Scarus*. The name was transferred by Cuvier from the type of *S. croicensis* to the present group. This transfer is inadmissible in our view, and the name *Calliodon* should not be used for the genus.

The name *Cryptotomus* was proposed by Cope for a fish having the "dentition of *Callyodon*, but with the numerous dorsal and anal spines of the group of *Harpe*." The fin rays are given D. XI, 8; A. III, 8. The numbers in all known species of *Scarina* are D. IX, 10; A. III, 9 (8). We do not believe in the existence of the genus *Cryptotomus* as thus defined. It seems to us almost certain, either that Professor Cope has mistaken two of the soft rays of the dorsal and one of the anal for spines, or else that these rays are in the sole specimen known, abnormally ossified. The difference between spines and soft rays in this group is very slight. We therefore regard *Cryptotomus* as a synonym of *Callyodon* Cuvier, and the latter name being ineligible, we adopt *Cryptotomus* as the name of the genus.

ANALYSIS OF SPECIES OF CRYPTOTOMUS.

COMMON CHARACTERS.—Lower pharyngeal and upper pharyngeals, isthmus, and lateral line precisely as in *Sparisoma;* lateral teeth of upper jaw coalescent into a more or less continuous cutting edge; the teeth more separate posteriorly; free posterior canines often present; anterior teeth separate or coalescent at base only; lower jaw with a single series of partly coalescent teeth laterally, and two or more series of nearly separate teeth anteriorly; median suture of jaws not evident; dorsal spines flexible; jaws subequal; scales about head large, a single row on cheeks, four or five on median line before dorsal. Species of small size.

a. Posterior canines, none; upper lip double for its entire course, the inner fold becoming mesially very narrow; caudal subtruncate; body slender; color olivaceous, much mottled, sides with faint whitish stripes; head with some greenish spots; fins pale, mottled with olive..... BERYLLINUS, 14.

14. Cryptotomus beryllinus, sp. nov.

Head, $3\frac{1}{6}$ ($3\frac{5}{6}$); depth, $3\frac{1}{3}$ ($4\frac{1}{5}$); length of an example from Key West, $5\frac{1}{4}$ inches.

Body more elongate than in related species; compressed.

Jaws pale, the median suture not evident; central portion of each tooth with a reddish-brown spot. Upper jaw laterally with a continuous cutting edge of coalesced teeth; this edge is even along the middle of the jaw and somewhat serrate posteriorly; anteriorly the cutting edge gives place to about two series of lanceolate, rather obtuse, compressed teeth, which coalesce at base only; no posterior canines in any of the many specimens examined. Lower jaw laterally with a single series of compressed teeth, coalescent for a short distance and close set. In front are two or three series similar to those in the upper jaw.

The chief difference between the teeth of this species and those of *Sparisoma* is in the separation of the anterior teeth of both jaws and in the distinctness of the lateral teeth of the lower jaw.

Jaws subequal, the lower very slightly included. Upper lip double for almost its entire length, its inner fold narrow mesially; the lip covering most of upper jaw. Isthmus moderate, the gill-membranes not forming a fold across it.

Eye moderate, $4\frac{1}{2}$ in head; snout rather acute, $2\frac{3}{4}$; cheek with a single row of about 5 scales; four or five scales on the median line before dorsal.

Lateral line subcontinuous, its tubes each with four branches, which cover most of the scale.

Dorsal spines very slender, not pungent; caudal fin slightly rounded, its outer rays $1\frac{1}{3}$ in head.

Lower pharyngeal formed exactly as in *Sparisoma;* not quite twice as broad as long, the surface slightly concave.

Color in life, olive-green, or olive-gray, mottled above with darker and whitish with small blotches; some whitish blotches above lateral line; some along lateral line; a row of five or six, smaller than pupil, in a straight line below lateral line; five or six faint greenish blotch-like areas along sides; two or three narrow, parallel whitish stripes more or less distinct along lower parts of sides bordered with brownish, the upper running from below eye straight to middle of caudal, the lower passing just below pectoral; some whitish bands radiating from eye; usually some dark green spots before and behind eye; top of head vermiculate and dotted with black; a brown band across chin; dorsal pale, mottled with olive; a dusky blotch on front of dorsal; caudal greenish, edged with brown, its outer rays barred with brown and light olive, speckled and barred with brown; ventrals pale, faintly barred with brown; pectorals pale; vertical fins in adult edged with light brownish-red. The whitish lines of sides become fainter with age.

In spirits the brown coloration gives place to grayish or greenish, each scale often with a greenish blotch.

This species is common about Key West on muddy bottoms. Numerous specimens of various ages were obtained, the largest about 6 inches in length. A single rather large specimen was secured in the market at Havana.

This species differs from *C. ustus*, and from the descriptions of *C. dentiens*, &c., in the entire absence of posterior canines in both young and old examples. *C. roseus*, which has no posterior canines, is very differently colored.

INDIANA UNIVERSITY,
April 8, 1884.

DESCRIPTION OF A NEW SPECIES OF SPHÆRIUM.

By TEMPLE PRIME.

Sphærium costaricense Prime.

Shell elongated, somewhat compressed, inequilateral; margins rounded, sulcations regular, deep; epidermis dark brown; cardinal teeth small; lateral ones strong.

Longitude, 12.0; latitude, 9.0; diameter, 6.0 millimeters.

Habitat.—Central America in Yuriria Lake, West Costa Rica; collected by the late Prof. W. M. Gabb, and presented to the United States National Museum by W. H. Dall. Number for the specimens on the Museum register, 37251.

This species is allied to *S. simile and S. striatinum.*

As far as I am aware this is the only instance known of the occurrence in Central America of the genus *Sphærium*, properly so called. As a rule this genus is replaced south of Mexico by the genus *Limosina*, a section of the original genus *Sphærium.*

New localities for American Corbiculidæ.

Sphærium striatinum Lam. San Joaquin River, California, near Stockton. H. Hemphill.

Pisidium virginicum Bourguignat. Yukon River, Alaska, near the Russian mission. W. H. Dall.

Pisidium abditum Haldeman. Pools on the north part of Unga Island, Shumagin group, Alaska, between Popoff Strait and Coal Harbor. W. H. Dall.

Pisidium æquilaterale Prime. Bering Island, Commander group, Bering Sea, in a pond near the Ladyginsk village. Dr. Leonhard Stejneger. Kotzebue Sound, in the clay covering the ice-cliffs of Elephant Point, Eschscholtz Bay; fossilized. W. H. Dall.

Dr. Carl Agardh Westerlund, of Rönneby, Sweden, who is working up the land and fresh water shells of the Vega expedition, has described the following species of *Pisidium* in the Nachrichtsblatt der Deutschen

Malakozoologischen Gesellschaft, 8° *Frankfurt am Main, M. Diesterweg*, 1883; vol. xv., pp. 58, 59.

Pisidium arcticum West. p. 58.

Pisidium nivale West. p. 59.

Pisidium glaciale West. p. 59.

All collected by the Vega expedition at Port Clarence, Alaska, near Bering Strait.

LIST OF FISHES COLLECTED AT KEY WEST, FLORIDA, WITH NOTES AND DESCRIPTIONS.

By DAVID S. JORDAN.

Three weeks of the month of December, 1884, were spent by the writer on the island of Key West, in making collections of the fishes in the interest of the United States Fish Commission and of the Indiana University.

The following is a catalogue of the species obtained, with color notes and other descriptive items. One hundred and seventy-one species in all were obtained. None others are included in the list, and the vernacular names here given are those only which are in use among the English-speaking fishermen of Key West. These fishermen are mostly from the Bahamas, where essentially the same nomenclature of the different species has long prevailed. Spanish names are also heard at Key West, but as these have been very exactly given by Professor Poey, I have not thought it best to introduce them here.

The general character of the fisheries of Key West has been elsewhere discussed by me (Bull. U. S. Fish Comm., 1884).

All the fishing is done with the hook and line. Most of it is for bottom fish (groupers, snappers, grunts, porgies, &c.,) in the channels between the Keys, at moderate depths. In the season the larger scombroid fishes (notably the king-fish) are caught by trolling. The bottom fishes are brought to the market alive in the wells of the smacks, and killed to suit purchasers. Of these, the grunt, *Hæmulon plumieri*, far exceeds in numbers all others.

In collecting, I made all possible use of the aid of the fishermen. About half the species obtained, and all those new to science, were taken with a large "Baird seine," of fine mesh, which was worked by the writer and his volunteer assistant, Mr. William H. Dye, of Indianapolis, Indiana. Every portion of the shore of the island suitable for seining was thoroughly examined. At no other point on the coast of the United States has the writer found small fishes so numerous and varied.

The character of the fauna is in general similar to that of Cuba, but there are numerous differences. Several northern fishes occur at Key West, which do not cross the channel, and many of the most abundant of the Havana market fishes are still not known from Key West. There

is a considerable difference in the temperature of the water at the two localities, and temperature is the chief factor governing the north and south extension of marine fishes.

Most fishes as seen at Havana are more dusky in color than those of the same species at Key West the pale color of the bottoms (of coral sand) of the latter locality may account for this.

Of the fishes inhabiting any considerable depth about Key West, absolutely nothing is known. All the species here named are shore fishes or else free-swimming oceanic species.

The numbers given after the names of the different species are those attached to specimens from this collection in the United States National Museum.

CARCHARIIDÆ.

1. **Carcharias punctatus** (Mitchill). *Shovel-nosed shark.*
(*Squalus* (*Carcharias*) *terræ-novæ*, Richardson.)
Very common. Not eaten.

2. **Carcharias lamia**. Risso. *Cub shark.*
(*Eulamia longimana*, Poey.)

Very common about the wharves and keys. One 7½ feet in length, taken with a hook from the wharf, showed the following characters: Head, 5⅓ in total length; snout from mouth, 2⅓ times in width of mouth; tail, 4 in total length; base of first dorsal, 9; insertion of first dorsal close behind base of pectoral; second dorsal in front of anal, and about equal to it in size, much smaller than first dorsal; base of first dorsal 1⅔ in interspace between dorsals; base of second dorsal, 1⅞; pectoral fin, 5 in total length; its greatest width 1⅔ in its length; its base, 2½.

From a female specimen of similar size 5 or 6 nearly mature fœtal examples were taken. Two of these are preserved; one is numbered 35053.

This species is the *Eulamia longimana* of Poey, which most late authors have identified with *C. lamia* of the Mediterranean. Comparing the fœtal examples above mentioned with a partly-grown specimen from Venice, we are unable to detect any difference at all likely to prove constant.

3. **Carcharias brevirostris** Poey.

Rather common about the wharves with the preceding, feeding on the refuse fish thrown away by the fishermen. A female 6½ feet long was taken with a hook. This specimen agreed fairly with the description published by Jordan & Gilbert (Proc. U. S. Nat. Mus., 1882, 245), the only differences being evidently due to age.

Color pale olive; no black on the fins. First dorsal of moderate size, inserted well behind the pectoral; pectoral rather long; very wide; its free margin concave, its top reaching to middle of first dorsal; base of first dorsal 2¼ in interspace between dorsals; base of second dorsal 2⅓; second dorsal unusually large, nearly opposite the anal, and about

half larger; caudal fin moderate; the upper teeth are distinctly serrate on both sides of the base.

SPHYRNIDÆ.

4. **Sphyrna tiburo** L. *Bonnet-head Shark.*

Common.

PRISTIDÆ.

5. **Pristis pectinatus** Latham. *Saw-fish.*

Rather common, the saws often brought in by the fishermen.

TORPEDINIDÆ.

6. **Narcine umbrosa**, sp. nov.

Two young male specimens, 10 to 11 inches in length, taken. The color is exactly alike in both, and is materially different from that given in any of the descriptions of *Narcine brasiliensis* or of the related variety or species *Narcine corallina* Garman (=? *Torpedo bancrofti* Griffith). Light brown; tip of snout blackish; a large black triangular area before each eye, covering most of the front of the disk; space between eyes pale: space between spiracles mostly pale; a round black blotch on median line behind this; a round blotch behind and outward from each spiracle; another near this on the edge of the disk; another behind this on the edge of the disk; a large transversely oblong blotch in line with this on each side of the median line; posterior part of disk with a dark blotch near the edge; a large black blotch between angle of pectorals and ventrals; ventrals each with two dusky blotches, the posterior one on the claspers; a dusky blotch on the back of the tail between them; each dorsal in a distinct black cross blotch, which extends up on the fins; a dark blotch on the tip of each dorsal and three on the caudal: in all about 30 distinct dusky spots and blotches above, all of them larger than the eye. There are also some rows of dark dots, apparently the mouths of pores, along each side of the tail above, near its base, and along the sides of the disk.

General form of the body more like that of *N. timlei* than that of *N. brasiliensis;* the disk very nearly circular, very slightly broader than long; the snout broadly rounded, and not at all exserted; the greatest width of the disk at its middle or opposite the third gill-opening; pectorals extending backward to base of ventrals, but scarcely covering them; spiracles smaller than the eyes, and close to them, their posterior edges roughened. Length of snout from eye, $4\frac{1}{3}$ in length of disk, and double the interorbital width. Nasal valve with a rather distinct rounded median lobe and obscure lateral lobes; edge of valve a little denticulated. Width of mouth about $1\frac{3}{4}$ in preoral portion of snout. Teeth sharp. Tail about $1\frac{1}{2}$ length of disk. Second dorsal a little higher and a little longer than first, the posterior margins of both subtruncate; that of the caudal lunate.

This fish may prove to be simply a variety of *N. brasiliensis* (Olfers), but in any event, the differences which it shows in color and form appear to justify a distinct name. It is apparently not common at Key West, but two specimens being obtained, these being not well known to the fishermen.

TRYGONIDÆ.

7. Trygon sayi (Le Sueur). *Stingaree.*

Not very common; one specimen seen.

SILURIDÆ.

8. Galeichthys felis (Linnæus). *Catfish.*

Very common about the wharves, where it is taken with the hook. It is seldom eaten.

It seems impossible to retain *Arius* as a genus distinct from *Galeichthys*. In several species of *Arius* (*brandti; dasycephalus*) the covering of the shields of the head by skin is a sexual character. The name *Galeichthys* is entitled to a few pages priority over *Arius*.

9. Ælurichthys marinus (Mitchill).

Rare; but one specimen obtained; considered a curiosity by the fishermen.

ENGRAULIDIDÆ.

10. Stolephorus browni (Gmelin). *Sardine.*

Exceedingly common in great schools in sheltered bays and in the surf; largely used for bait. (Number 35000.)

11. Stolephorus perfasciatus (Poey).
(Not *Stolephorus perfasciatus* Jor. & Gilb.).

A few specimens obtained.

12. Stolephorus miarchus Jordan & Gilbert.

A few specimens; not distinguishable from the original types of this species from Mazatlan.

CLUPEIDÆ.

13. Dussumieria stolifera Jordan & Gilbert.

Very common in schools in the surf in company with *Stolephorus browni*.

14. Clupea sardina Poey.

Not rare in schools in the surf. I doubt the identity of this species with either *Clupea macrophthalma* or *Clupea humeralis*.

Color in life, light green above; a lustrous band along sides; silvery below, with bright reflections, scales often shaded with orange and dotted with black; no black humeral spot, but a yellowish blotch in the scapular region; fins all pale; dorsal and anal yellowish, tipped with

dusky; lower jaw yellowish, dotted with black. Cuban specimens show more orange tinge, orange streaks being distinct along the rows of scales.

Body comparatively deep and compressed; lower jaw projecting; teeth in broad patches on jaws, vomer, palatines, and tongue; maxillary nearly reaching middle of eye; its length, $2\frac{2}{5}$ in head; eye very large, considerably longer than snout, $2\frac{3}{4}$ in head; cheeks and opercles striate; gill-rakers rather few and not long; scales large, firm, but not adherent as in other species of this group (*Harengula*), readily deciduous; each scale crossed by several conspicuous radiating ridges; insertion of dorsal little before that of ventrals, at a point considerably nearer snout than base of caudal; dorsal a little higher than long, its free edge concave; anal low; pectorals nearly reaching ventrals, $1\frac{1}{3}$ in head.

Head $3\frac{1}{3}$ in length to base of caudal; depth, $3\frac{1}{3}$; D. 1, 15; A. 18; Lat. l. 36. Ventral scutes about 15 + 10. Length of specimen described about 8 inches. Specimens in National Museum are numbered 34993.

15. Clupea pensacolæ (Goode & Bean). *Pilchard.*

Exceedingly common, in large schools. Our specimens agree fully with others from Cedar Key and Pensacola. The species much resembles the Cuban one for which Poey has adopted the name *Cl. clupeola*. The latter is, however, constantly more elongate, and differs in some other respects.

Key West specimens, in life, were light green above; a lustrous yellow streak along sides; no humeral spot; fins all pale; the caudal lobes dusky at tip; upper part of eye dark; scales of back dark-edged.

ALBULIDÆ.

16. Albula vulpes (Linnæus). *Bone-fish.*

Not rare. The "bone-fish," elsewhere in the United States, held in low esteem as a food-fish, is highly valued at Key West.

ELOPIDÆ.

17. Elops saurus Linnæus. *Tenpounder.*

Not rare. A food fish of moderate value.

18. Megalops atlanticus (Cuv. & Val.). *Tarpum.*

Occasionally taken.

SYNODONTIDÆ.

19. Synodus fœtens Linnæus.

One large specimen taken.

20. Synodus spixianus Poey. *Sand-fish.*

Common; taken with the seine in sandy or muddy bottom. None of the specimens seen are more than 9 inches long.

Sandy gray in life, light or dark, the upper parts much mottled with darker olive; branchiostegals pale yellowish; top of head without vermiculations; dorsal scarcely barred; caudal dusky; other fins pale, with little or no yellow; lower parts of head mottled with dusky; no scapular spot; tip of snout not black.

This species is very close to *S. fœtens*, and may possibly be found to intergrade with it. In our specimens the teeth are rather stronger than in *S. fœtens*, the jaws a little longer, the upper $1\frac{1}{2}$ in head; dorsal shorter and higher than in *S. fœtens*, the anterior rays when depressed extending beyond the tips of the last rays, $1\frac{3}{4}$ in head. Scales as in *S. fœtens*; pectorals 2 in head; ventrals $1\frac{1}{4}$. D. 1, 9; A. 11 or 12; Lat. l. 60.

Specimens from Cuba agree with these from Key West. One of the Key West specimens is numbered 35098.

21. Synodus cubanus Poey. *Miller's Thumb.*

(*Saurus intermedius* Günther, v, 396, not of Agassiz and Spix; *Synodus intermedius*, Jor. & Gilb, Proc. U. S. Nat. Mus., 1882, 249, and Syn. Fish. N. A., 1883, 889; *Synodus cubanus*, Poey, Enum. Pisc. Cubens., 1875, 143.)

Common about rocks, reaching a considerable size (18 inches). Often taken with the hook but not used as food. Our specimens appear to belong to the same species as those from Pensacola, formerly called by us *Synodus intermedius*. They seem also to be identical with Poey's *S. cubanus*, although differing in some slight respects. The fish called by Poey *Synodus intermedius* (Enum. Pisc. Cubens., 1875, 143) of which we have numerous specimens from Havana, is still another species, having the mouth smaller than in *S. cubanus*, the scales larger (lat. l. 45), and the scapular region without distinct black spot. This species is apparently the original *S. intermedius* of Spix and Agassiz, not yet known from our coasts.

The life colors of large specimens of *Synodus cubanus* are as follows:

Back olive-gray, with blotches of dark olive-brown; these irregular in form and size and mingled with smaller ones; eight or nine on back, nine on sides; those on the sides not quite below the dorsal blotches, but more or less in advance of them, especially anteriorly; a dark blotch at base of caudal; an inky blotch on scapula, hidden by the opercle; top and sides of head mottled like the body; no yellow below head; jaws orange within; breast with a brown line along each series of scales; two rows of scales on lower part of sides, with an orange spot on each scale, forming continuous stripes; belly white; dorsal with olive bars formed of coalescent spots and with whitish spots; caudal yellowish, with olive-brown bars; pectorals similar; ventrals yellowish, the rays bluish white; anal yellow, whitish at base.

A specimen from Key West is numbered 35045.

CYPRINODONTIDÆ.

22. Lucania parva (Baird & Girard). *Rain-water fish.*

(?*Cyprinodon parvus* Baird & Girard, Ninth Smithsonian Report, 1845, 345; *Lucania parva*, Jor. & Gilb., Syn. Fish. N. A. 893.)

Very common in shallow waters and tide pools close to the shore, especially where fresh waters soak in to the sea. Length, 1½ to 2 inches.

Color in life: Males, olive, with bluish reflections; edges of the scales darker; dorsal dusky orange, with a large black spot at the base in front, ocellated with orange; caudal orange-yellow, tipped with black; ventrals and anal orange-red, tipped with dusky; pectorals translucent. Females larger, the fins pale olive, without black spot or edgings.

Our specimens have the body deeper than in *L. venusta*, the depth being about 3¼ in length. In other respects they agree closely with the latter. They are apparently identical with specimens from Eastern Florida referred by Dr. Bean to *Lucania parva*, a species described originally from Long Island, and known to me only from Dr. Bean's notes. Head, 3½ in length; D. 1, 10; A. 10; scales 26—8.

23. Fundulus similis Baird & Girard. *Sac-a-lai.*

Very abundant in lagoons and tide-pools, reaching an unusually large size.

24. Fundulus heteroclitus Linnæus. *Mud-fish.*

Fundulus grandis Baird & Girard.

With the preceding; less abundant than farther north.

25. Cyprinodon riverendi Poey.

Trifarcius riverendi Poey, Memorias Cuba, ii, 306, 1860.

Rather common in shallow waters near the shore; reaches a length of 2½ inches. This species is very close to *Cyprinodon gibbosus* B. & G. (the Gulf representative of *C. variegatus*), but with larger scales, smaller head, and the anal edged with black. The nominal genus, *Trifarcius*, based on the presence of six branchiostegals, is identical with *Cyprinodon;* the same number being found in *Cyprinodon variegatus*, contrary to the statement of Valenciennes.

Male in life with the antedorsal region lustrous steel blue, as in *C. gibbosus;* the rest of the body olivaceous, obscurely clouded, but without dark cross-bars. A black bar at base of dorsal; a dark shade below eye; anal and caudal edged with black; ventrals and anal red; dorsal dusky, edged with orange; pectoral plain, tipped with orange and blackish.

Female more silvery: the back olivaceous and speckled: the sides with about 13 blackish bars, which do not reach the back; these alternately broad and narrow; no yellowish shades; a dusky bar through

eye; lower fins whitish; upper pale; dorsal fin with a black ocellus; a dark band across base of caudal.

Head 3⅓ in length; depth, 2. D, 10; A, 9. Scales 24—12.

26. Cyprinodon mydrus Goode & Bean. *Pussy gut.*

(? *Cyprinodon carpio* Günther, vi, 306.)

Exceedingly abundant in lagoons and shallow shores. A strongly-marked species, larger than most others of the genus, reaching a length of 3 inches.

Body comparativey elongate, rather strongly compressed; head large; profile not very steep; fins rather low, the dorsal and anal not nearly reaching caudal; humeral scale not larger than the others. Eye in adult 3½ in head. Scales very thick and firm, those on lower parts of body less reduced in size than usual. Pectorals reaching middle of ventrals, which reach vent. Head, 3; depth, 2⅔. D. 11; A. 9. Scales 24—9.

Male in life, light olive; sides silvery, with six narrow faint bars of coppery; sides with a number of spots of bright clear yellow, besides the blotches of orange found in the females. Lower jaw mostly golden; three bright yellow stripes obliquely across the cheeks to the jaws. Dorsal and caudal finely speckled with olive. Tip of dorsal orange, as also the lower edge of caudal and anal; ventrals orange-red; no ocellus on dorsal.

Female pale, with numerous blotches of light bright orange, these mostly longitudinally oblong on upper parts and irregular or vertical below; sides of head marked with bronze; lower jaw whitish; fins plain; dorsal and caudal slightly yellow. Young females with traces of one or two dusky bars at base of caudal. Still younger specimens (as in the original types) nearly plain silvery.

MURÆNIDÆ.

27. Sidera funebris (Ranzani). *Green Moray.*

(*Gymnothorax funebris* Ranzani, Nov. Comm. Ac. Sci. Inst., Bonon., iv, 1840, 76; *Muræna afra* Günther, viii, 123; apparently not *Gymnothorax afer* Bloch; *Muræna infernalis* Poey, Mem. Cuba, ii, 347.)

Rather common, reaching an enormous size; a specimen obtained being about five feet in length, and it is said to attain double that length. It is not used for food. It is much disliked by the fishermen, as its bite is often serious, and it tangles or destroys their lines. It lives in crevices in the reefs, and it is said that it frequently bites off the heads of cormorants and other water birds who venture near its holes.

In life it is bright yellowish-green, with some oblique dark streaks on the fins; after death the green rubs off readily, as a sort of slime, leaving the skin brown beneath. In spirits the color is a uniform purplish-brown.

This is probably not the *Gymnothorax afer* of Bloch, described from a specimen from the coast of Guinea, as *afer* is said to be brown, marbled

and banded with white. After rejecting this name, the name *funebris* of Ranzani appears to have the right of priority.

28 Sidera moringa Cuvier. *Moray; Helmet.*
(*Gymnothorax rostratus* Agassiz.)

Very common about the reefs. It reaches a length of two or three feet. It is seldom brought to the market, and is eaten only by the Cubans, although it has not the reputation of being poisonous possessed by *S. funebris*.

Ground color, greenish-white above; quite yellowish-green on dorsal fin and back; head and belly pearly tinged; anal and posterior part of dorsal with the edge slightly paler. Entire body and fins everywhere almost equally marked with dark olive confluent, roundish, but irregular, spots, mostly smaller than pupil, but some of them larger than eye. These are sometimes so numerous as almost to exclude the ground color; at other times so sparse as to render the fish comparatively pale. Mouth spotted within; no black at angle of mouth or around gill opening.

Specimens from Cuba are darker, the spots being more numerous, but they do not differ otherwise. The name *Moray* appears to be universal for this species among the English-speaking fishermen. A specimen paler than usual was brought to me as a different species, under the name of "*Helmet*."

The darker variety is probably the original of Catesby's "*Muræna maculata nigra*, the Black Moray," on which figure the *Muræna moringa* of Cuvier was founded. If this view should prove erroneous it will be necessary to again use the name *rostrata* for this species.

A specimen from Key West is numbered 35036.

ANGU LLIDÆ.

29. Anguilla rostrata (Le Sueur).

A single extremely young eel was taken in a seine in *Enteromorpha* in the harbor. The species seems to be entirely unknown to the Key West fishermen; nor did I find any who had ever heard the word "eel." The species of this genus apparently seldom venture far from the brackish or fresh waters.

SCOMBERESOCIDÆ.

30. Tylosurus notatus (Poey). *Gar-fish.*

Very common, in large schools close to shore. As many as four hundred were taken in a single haul of the seine. This species reaches but a small size, the largest seen being less than 18 inches long.

Color in life, very pale greenish, the lateral line bluish, the edges of the scales with many dark points; a blue-black line bounding the base of lower jaw above. Tips of all the vertical fins of a pale brick-red; middle of caudal dusky. A deep blue-black spot on upper front of opercle.

This species is rarely used as food, from its small size.

Three specimens from Key West are numbered 34998.

31. Tylosurus sagitta Jor. & Gilb.

Not common. Three specimens taken with the seine at the same time.

32. Tylosurus crassus (Poey). *Hound-fish.*

(? *Belone raphidoma* Ranzani, Nov. Comm. Act. Inst., Bonon., v, 1842, 359; *Belone crassa* Poey, Mem. Cuba, ii., 1860, 291; *Belone jonesi* Goode, Amer. Journ. Sci. Arts, 1877, 295; *Belone jonesi* Günther, Ann. Mag. Nat. Hist. iii, 1879, 150; *Tylosurus gladius* Bean, Proc. U. S. Nat. Mus., 1882, 430).

Common in schools about Key West; the young very abundant. It reaches a length of 4 feet, and the large specimens are occasionally brought to market. The variations in age with this species are considerable, the adults having the beak considerably more robust and proportionately shorter than the young. We have compared our Florida specimens with numerous others, young and old, from Cuba, and can find no difference. One of the larger ones corresponds exactly to the type of *Tylosurus gladius* as described by Dr. Bean.

Body robust, especially in the adult, somewhat deeper than broad; the tail rather depressed, broader than deep; beak rather short and stout, becoming proportionately shorter with age, and its length $1\frac{2}{3}$ to $1\frac{5}{6}$ that of rest of head; teeth strong, green; eye large, about $2\frac{1}{3}$ times in postorbital part of head; maxillary covered by preorbital; top of head with a very broad and shallow median groove; the middle and posterior parts of the head covered with smooth transparent skin; supraorbital bones broad, prominent, finely striated; two folds of translucent skin crossing preopercle above, and one near its angle; pectorals rather longer than postorbital part of head, their upper ray broad; anal and dorsal falcate, subequal, opposite, their posterior rays elevated in the young, but becoming very short in the adult; ventrals well developed; caudal large, the lower lobe much the longer, $2\frac{2}{3}$ in head. Head $3\frac{1}{5}$ in length; depth 13 to 15; D. 1.21 to 1.24; A. 22 to 24; scales minute, but evident.

Color in life deep, clear green above, white below; no lateral stripe; sides with a row of large, round, dusky blotches, distinct only in the young, and fading in spirits; jaws with blue shades; axil dark; a dark bar behind cheek; pectoral broadly blackish at tip; more or less of dusky shading on dorsal, caudal, and ventrals; no red anywhere; lateral line forming a low black keel on caudal peduncle; bones green.

Three specimens from Key West are numbered 35039.

33. Hemirhamphus unifasciatus Ranzani. *Balaó* (*"Bally-hoo"*.)

(*Hemirhamphus richardi* and ? *H. picarti* Cuv. & Val.)

(*Hemirhamphus fasciatus* Poey; *Hemirhamphus poeyi* Günther.)

Extremely abundant about Key West, in large schools in quiet water; taken in large numbers with the seine. Specimens entirely similar also obtained at Havana.

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Color in life clear, light greenish; the dots on the scales above lateral line all clear blue-black, these giving the fish a decidedly bluish cast; a bluish-silvery lateral band; head mostly light blue above, the brain cavity appearing yellowish; sides of head iridescent silvery; lower jaw bluish above, its flap white with a blackish edge, its tip scarlet; side of lower jaw blue at base; dorsal and pectoral bluish; caudal light reddish edged with blackish; ventrals and anal pale, the latter tipped with blackish.

This species is very close to *Hemirhamphus roberti* Cuv. & Val. (*H. unifasciatus* of most late writers), from which it seems to differ chiefly in the shorter beak and the more robust and less compressed body. The number of dorsal rays is usually one or two less.

Lower jaw from end of upper longer than rest of head and 6 to 7 in total length from its tip to base of caudal (about 4½ in *H. roberti*); head with lower jaw 3 in length; body but half deeper than broad; premaxillaries broader than long; eye less than interorbital width, three-fifths postorbital part of head: insertion of ventrals midway between eye and base of caudal; dorsal and anal densely scaly; back broad above.

Head, 4⅝ in length; depth, 6½. D. 12 to 14; A. 15; Lat. l. 52. Length, 12 inches.

I know from comparison of specimens that this species is identical with the Cuban one called by Dr. Günther *H. poeyi*. *H. richardi* C. & V., distinguished from *H. roberti* and other species by the shorter snout seems to be the same, as is probably *H. picarti* also. The figure given by Ranzani represents the short-beaked form, which is apparently the common *Hemirhamphus* of the West Indies, while the *H. roberti* C. & V., is best known from the southern coasts of the United States. There is not much doubt, therefore, that it is for the former that the name *H. unifasciatus* of Ranzani was originally intended.

Both *H. unifasciatus* and *H. roberti* occur on the Pacific coast of Mexico and Panama, but the latter is not yet known either from Key West or Havana.

Young specimens of *H. unifasciatus* have the lower jaw proportionately longer and are not easily separated from *H. roberti*. Comparing specimens of the same size it will be found that the latter is always in all parts more slender, although the difference is not very great.

Four examples from Key West are numbered 34999.

34. Hemirhamphus balao Le Sueur. *Balaó.*

(*Hemirhamphus balao* and *marginatus* Le Sueur; *Hemirhamphus pleii* Cuv. & Val.; *Hemirhamphus filamentosus* Poey; *Hemirhamphus brasiliensis* Jor. & Gilb., Syn. Fish, N. A., 902; probably not *Esox brasiliensis* L., or *Hemirhamphus browni*, C. & V.)

Very abundant about Key West, in large schools in water of moderate depth, always frequenting the sheltered side of wharves, bars, &c. It

reaches a length of about 15 inches. It is rarely brought into the markets, although an excellent pan-fish.

Color in life deep clear blue-green above, much darker than in *H. unifasciatus;* sides silvery. No distinct lateral band. Beak dark, its tip bright orange; its membrane edged with white. Lobe of dorsal and upper lobe of caudal always of an intense orange-yellow, which is deepest toward the tip. Ventrals tipped with yellow. Fins otherwise pale. Sexes colored alike.

Insertion of ventrals about midway between base of caudal and middle of pectoral.

We have elsewhere used the name *brasiliensis* for this species, but this arrangement seems hardly allowable. *Esox brasiliensis* L. is based on two descriptions, the one of a *Tylosurus* from Brazil, which suggested the name *brasiliensis*, the other of a *Hemirhamphus* from Jamaica. The last is thought by Valenciennes to be identical with his *H. browni*. *H. browni* is said to have 65 scales in the lateral line. If so, it must be a species different from *H. balao*. In any event, the name *brasiliensis* should, I think, be restricted to that one of its component species which came from Brazil, that is, to the *Timucu* of Marcgrave.

A *Hemirhamphus* of this type occurs on the Pacific coast of Mexico. As, however, it has no conspicuous orange on its fins, it will probably prove to be a different species.

Two examples from Key West are numbered 35044.

35. **Chriodorus atherinoides** Goode & Bean. *Hard-head.*

Excessively abundant in sandy bays on the sheltered side of the island. It reaches a length of about 10 inches, and is known to the fishermen as "hard-head." It is an excellent pan-fish, but from its small size it is seldom brought to the markets. Like the *Hemirhamphi*, it feeds chiefly on green algæ.

Translucent greenish above, with dark dots on the scales: sides silvery, a bright silvery lateral band as in *Atherina*. This is broadest under the dorsal fin, where it is about as wide as the pupil.

Head, $4\frac{2}{3}$ in length; depth, $5\frac{2}{3}$. D. 1, 15 or 1, 16; A. 1, 15; Lat. l. 48. Interorbital space a little broader than eye in adult; eye, $3\frac{5}{6}$ in head: snout, 3. Scales rather firm; bones of top of head smooth, hard, translucent.

Eleven specimens from Key West are numbered 35102.

SYNGNATHIDÆ.

36. **Siphostoma floridæ** Jor. & Gilb.

Not rare.

37. **Siphostoma affine** (Günther).

Very common in algæ everywhere about the island of Key West.

38. **Siphostoma louisianæ** (Günther).

Common.

39. Siphostoma mackayi Swain & Meek.

Numerous specimens taken with the seine in eel-grass. Types of the species are numbered 34989, from Key West.

40. Siphostoma miurum Swain & Meek.

One specimen obtained, the type of the species.

41. Siphostoma crinigerum Bean & Dresel.

Numerous specimens.

42. Siphostoma zatropis Jor. & Gilb.

Several large specimens taken in eel-grass.

43. Hippocampus punctulatus Guichenot. *Sea Horse.*

A single dried specimen, in poor condition, obtained from a fisherman.

44. Hippocampus hudsonius DeKay.

Two specimens, one nearly adult, one very small, taken with the seine in Fucus.

The large specimen evidently belongs to the species described by Jordan & Gilbert (Syn. Fish. N. A., 907) as *Hippocampus hudsonius*.

Color dusky, without distinct spots, but with irregular, sharply-defined grayish lichenoid blotches on head, body, and tail, not quite symmetrical on the two sides, but nearly so, those on the tail forming irregular pale bands. Head freckled with grayish.

Eye with radiating whitish streaks; snout with a narrow, whitish cross-band, a whitish longitudinal band behind eye. Dorsal mottled. Snout, 1⅓ in rest of head. Spines comparatively blunt, but some of them large, the four on median line of belly especially so. D. 19, covering 3½ rings; 11 body rings. Opercle with radiating striæ.

It is not very certain that DeKay's specimen belonged to this species. His description fits this better than it does any other of the four which are definitely known from our Atlantic coast (*punctulatus*, *hudsonius stylifer*, *zostera*). The species described by Professor Goode (Proc. U. S. Nat. Mus., 1878, 45), from Saint George's Bank, as *Hippocampus antiquorum*, is apparently more like the present species than like the European *H. hippocampus* (*antiquorum*, *heptagonus*). The latter species should probably be omitted from the list of American fishes.

MUGILIDÆ.

45. Mugil albula L. *Callifavor Mullet.*

Common in the fall. Only salted specimens seen. I do not know the origin or the proper orthography of the name "*Callifavor*" applied to this species by the fishermen.

46. Mugil brasiliensis Agassiz. *Blue-back Mullet.*

Rather common in the winter in schools, in bays where the water is somewhat deep. The most valued as food of the species of mullet at Key West.

This is the species called by Poey *Mugil gaimardianus* and is apparently the *Mugil gaimardianus*, Desmarest, figured in 1831, but so far as I know never described.

47. Mugil trichodon Poey. *Fan-tail Mullet.*

Very common about Key West, the young taken in large numbers in the seine. It reaches a smaller size (about a foot) than any of the other American species, is more robust in form, and has much larger scales than any other, except *Mugil liza*, which it resembles in no other respects.

Color in life silvery, light olive above, unstriped; a narrow groove at base of each scale on back, top of head and on sides; base of pectoral dusky-bluish. Soft dorsal and caudal narrowly edged with blackish; middle of anal dusky; eye very large, pale, its adipose membrane large and transparent.

Body deeper than in related species, compressed; head short, not very obtuse. Interorbital space convex, its width $2\frac{1}{2}$ in head. Eye, $3\frac{1}{5}$ in head. Maxillary mostly concealed by the preorbital; lower jaw acute in front, the angle formed by the dentary bones rather more than a right angle; dentiform papillæ much longer than in *Mugil brasiliensis* (although much shorter than described in *Mugil trichodon*), rather stiff. Upper lip unusually thick; its depth in front half diameter of eye; tongue with asperities; pectoral $1\frac{1}{3}$ in head, its tip not reaching front of dorsal by a distance equal to three-sevenths of its own length; soft parts of vertical fins densely scaly; free edge of dorsal and anal much concave; first dorsal spine $1\frac{1}{7}$ in head; caudal broad and rather short, its lobes as long as head.

Head, 4 in length; depth, $3\frac{1}{5}$; D. IV,–1, 8; A. III, 8. Scales, 34–12.

This is probably *Mugil trichodon* Poey, although his description indicates a fish with longer head, slenderer body, shorter dorsal spines, and longer dental cilia.

48. Querimana gyrans Jor. & Gilb.

Abundant in small schools about the wharves. Swimming at the surface close together, like "Whirlagig-beetles" (*Gyrinidæ*). It is not likely that these fishes reach a length of more than 2 inches and they are most assuredly not the young of any species of *Mugil*.

ATHERINIDÆ.

49. Atherina laticeps Poey. *Sardine.*

?Atherina stipes Müller & Troschel.
Atherina laticeps Poey.
Atherina relieana Goode & Bean.

Extremely abundant everywhere about the island, swimming in schools. Often used as bait. It reaches a length of less than 3 inches. It is readily distinguished from related species by its broad head, thick body and large eye.

It is also not uncommon in Cuba, numerous specimens being seen in the Havana market. These are, as usual with Cuban fishes, somewhat darker in color than Key West specimens, but are not otherwise different. There is, therefore, no doubt of the identity of *A. reliciana* with *A. laticeps*. The account of *A. stipes* given by Dr. Günther agrees very well with our specimens, but it is hardly sufficiently detailed to warrant the substitution of the name *stipes* for that of *laticeps*. In one or two slight respects the description of Poey (Memorias, II, 265) is erroneous. Thus the pectorals form rather more than one-sixth the length of the body, even including the caudal fin, and the insertion of the first dorsal is in front of the middle of the body, if this fin be included, and behind it if it be excluded.

Color in life translucent green, silvery, below with a well-defined silvery lateral band; a series of dots along the side below this; back with dark dots forming streaks along the rows of scales; snout above with black dots; fins pale, nearly plain. A dusky shade at base of caudal.

Eye, $2\frac{1}{3}$ in head; snout, 4; interorbital space, $2\frac{1}{4}$. Head, $3\frac{2}{3}$ in length; depth, $4\frac{2}{3}$. D. V–1, 9; A. 1, 11. Scales, 36–6. Insertion of first dorsal rather nearer anal than ventrals. Upper edge of orbit sharp, nearly smooth. Maxillary reaching front of pupil.

50. Atherina aræa Jor. & Gilb.

Not very common. A small, slender fish, found in schools of the preceding.

SPHYRÆNIDÆ.

51. Sphyræna picuda Bloch & Schneider. *Barracuda.*

Very abundant, reaching a length of 4 or 5 feet or more. Considered an excellent food-fish, although regarded with a little suspicion, as it is said to be sometimes poisonous. The poisonous character of this and various other suspected fishes is said to be confined to those taken on the growing reefs, and it is thought to be due to some animal eaten by the fishes.

In the sheltered places among the wharves at Key West are vast schools of *Atherina*, *Stolephorus*, and *Dussumieria*. These swim near the surface, and among them and feeding on them, likewise swimming at the surface, are the species of *Tylosurus*. Lower down in the water are the Pilchard (*Clupea pensacolæ*), and among these are the Barracuda, little and big, the most voracious of all the fishes at Key West. They hover midway in the water, motionless, except for the undulations of the pectoral fins, finally darting with great swiftness into some school of smaller fishes.

The resemblance of the Barracuda in habits to the fresh-water pike (*Esox*) is very great, and both are very destructive to small fish.

Three specimens from Key West are numbered 35034.

POLYNEMIDÆ.

52. Polynemus virginicus Linnæus. (*Polynemus plumieri* (Lacépède).)

Two very young specimens taken in the surf. There is not much doubt that this is the species intended by Linnæus, in his description of *Polynemus virginicus*, although the character "*cauda integra*" does not apply to any *Polynemus*.

Silvery, back and upper part of sides dotted with blackish; lower lobe of caudal and tips of dorsals partly black; pectoral pale; pectoral filaments reaching a little past vent.

In older specimens from Cuba the speckled coloration disappears; the pectoral becomes largely black, and the other fins grow more dusky, the markings on the caudal becoming more diffuse.

ECHENEIDIDÆ.

53. Echeneis naucrates Linnæus. *Sucking-fish; Sucker.*

Very common. Found attached to sharks, groupers, or any other large fish, without regard to species. Few large sharks are without them. Often caught with hook and line from the wharf, where they frequently forsake their host to take the bait.

TRICHIURIDÆ.

54. Trichiurus lepturus Linnæus. *Silver-fish.*

One large specimen taken; more abundant in summer.

XIPHIIDÆ.

55. Histiophorus americanus Cuv. & Val. *Spike-fish.*

(*? Histiophorus gracilirostris* and *? H. ancipitirostris* C. & V., VIII, 1831, 308, 309. *? Makaira nigricans* Lacépède, IV, 688, 1803.)

One large specimen taken with trolling hook. As no description has yet been published of an American *Histiophorus*, I give the following notes on this specimen, the skin of which is preserved:

Bluish-black, paler below; dorsal dusky-bluish; its membranes with many almost perfectly round black (not blue) spots, which are from one-third to one-fourth diameter of orbit.

Snout from eye $2\frac{7}{8}$ times length of rest of head. Lower jaw $2\frac{1}{2}$ in head. Front of eye nearly midway between tip of lower jaw and edge of opercle. Interorbital space broad, flattish, $1\frac{3}{5}$ in postorbital part of head. Maxillary reaching to slightly beyond eye, which is $3\frac{1}{3}$ in postorbital part of head and 10 times in length of snout. Sword narrow, regularly tapering, depressed, its upper and lower surfaces rounded, less rough than the blunt edges. Sword nearly twice as broad as deep for its entire length. Breadth of sword at a point midway between its tip and the front of eye contained twenty-five times in its length from the eye. Longest dorsal spine three-fourths length of head. Ventrals, $1\frac{5}{6}$ in head. Pectorals, $2\frac{2}{5}$; caudal lobes, $1\frac{7}{8}$.

Head about $2\frac{3}{8}$ in length ($3\frac{1}{4}$ with caudal); depth about 6. D. XLI–7; A. 9–7. Length of specimen, 6 feet.

This specimen differs considerably from the current descriptions of *H. gladius*. The sword is much longer and more slender, and the number of dorsal spines is less.

It is probable that this is, as recently suggested by Mr. Goode, a distinct species, for which the name *americanus* should be retained.

The much discussed *Makaira nigricans* of Lacépède (IV, 688, 1803) is probably the same species, but the description is altogether insufficient for identification.

SCOMBRIDÆ.

56. Acanthocybium solandri (Cuv. & Val.). *Wahoo.*

(*Cybium solandri* Cuv. & Val., 1831.
Cybium sara Bennett, 1849.
Cybium petus Poey, 1860.
Cybium veranyi Doderlein, 1872.)

Not very common about Key West. A single large specimen taken. Called by the fishermen "*Wahoo*," by the Cubans "*Peto*."

Iron gray, dark above, paler below; fins colored like the body; no distinct markings anywhere. Gape more than half length of head; eye 5 in snout; premaxillaries in front produced in a sort of beak, which is nearly half length of snout; teeth somewhat irregular, trenchant, ovate, or subtruncate in form, their edges finally serrate, the posterior teeth much the largest; villiform teeth on vomer and palatines. Dorsal spines mostly subequal, the highest behind the middle of the fin, $5\frac{3}{8}$ in head. Dorsal and anal lobes low. Caudal lobes short, very abruptly spreading, their length about two-thirds head. Pectoral not quite half head.

D. XXIV–1, 12–IX; A. 1, 12–IX.

57. Scomberomorus cavalla (Cuvier). *Kingfish.*

(*Cybium cavalla* Cuvier, 1829, after Marcgrave.
Cybium caballa and *immaculatum* Cuv. & Val., 1831.)

One of the most important food-fishes of the Florida Keys in the time of its runs (December to April). It is taken with a trolling-line, and is brought into the market in great numbers. It is justly considered one of the best of the food-fishes, having firm, well-flavored flesh. The first of the run (November, early December) sell at high prices. Later, however, they become cheap, and their abundance interferes with the profits of the fishermen who seek for "bottom-fish" (*Epinephelus*, *Hamulon*, *Lutjanus*, &c.). The usual weight of the kingfish is from 6 to 40 pounds, but specimens still larger are occasionally taken.

Iron gray, adult nearly or quite immaculate and without black blotch on anterior part of spinous dorsal; young, paler, and with numerous faint round bronze spots, somewhat as in *S. maculatus*, the spinous dorsal then more or less dusky anteriorly. This reaches a larger size than the others in the genus, and has stronger teeth. Under all circumstances it is readily distinguished by the presence of but 14 (rarely 15)

spines in the dorsal and by the direction of the lateral line, which descends abruptly below the second dorsal, instead of gradually, as in the other American species (*regalis*, *maculatus*, *concolor*), all of which have 17 or 18 spines in the dorsal.

58. **Scomberomorus maculatus** (Mitchill). *Spanish Mackerel.*

Not common; two or three specimens seen. Not distinguished by the fishermen from the next species. Neither are held in special esteem at Key West, and both are less valued than the great kingfish, which reaches a much larger size than they. In this species the spots on the sides never coalesce into a lateral stripe.

59. **Scomberomorus regalis** (Bloch). *Spanish Mackerel.*

Rather common; numerous specimens brought in with the kingfish. Also occasionally taken with hook and line from the wharves. The coloration of this species is similar to that of the preceding, but the bronze spots are rather larger, and one series of them coalesce to form a more or less interrupted narrow lateral bronze stripe. The caudal peduncle and caudal lobes are distinctly slenderer than in *S. maculatus* and the eye is a little larger; the angle of the preopercle is more produced backwards in *S. regalis* and the mouth is perhaps a trifle smaller. There is no difference appreciable in the dentition. The two species are therefore very close, but there is no reason to doubt their distinctness.

60. **Euthynnus alliteratus** (Rafinesque). *Bonito.*
(*Scomber alliteratus* Rafinesque, 1810.
Scomber quadripunctatus Geoffroy St. Hilaire, 1809?
Thynnus thunnina Cuv. & Val., 1831.)

Common, taken with the kingfish, but in much less abundance. A food fish of moderate value, the flesh being considered coarser than that of the kingfish. The black spots on the side of the breast which suggested the name *quadripunctatus* vary somewhat, five being often present. We are not sure as to the priority of date between *quadripunctatus* and *alliteratus*.

CORYPHÆNIDÆ.

61. **Coryphæna hippurus** L. *Dolphin.*

Not uncommon; three adult specimens, taken with troll-hook by kingfish fishermen; one is a male, the other two are females; all with sexual organs well developed. There is no difference in color in the two sexes, the only evident sexual difference being in the great development of the crest on the top of the head in the male.

In life the ground color is a deep, clear yellowish, or olive-green, golden-green on the sides, paler below. In death the green and olive fade rather suddenly to a grayish-silvery, tinged with bluish and with bright reflections, the olive remaining in irregular patches on various parts of the body. The changes in the color in the dying dolphin have been, as Professor Gilbert has already (Proc. U. S Nat. Mus., 1882, 598)

stated, greatly exaggerated; neither in life nor death does the fish show "all the colors of the rainbow," and its changes in death are not more than the average changes of brightly or delicately colored fishes. They are far less striking than the changes in some species of *Calamus*, especially *C. pennatula*.

The spots on the body remain unchanged in death. There is in the specimens now noticed a row of small ink-like spots of deep blue along the base of the dorsal; these much smaller than the pupil. Middle and lower part of sides with scattered roundish spots of clear blue, paler than those on the back. Dorsal blackish (with bluish blotches after death), and with scattered pale blue spots, most of them ill defined. Caudal plain, anal dusky, paler than dorsal, with blue spots.

Pectoral blackish within, externally pale, its axil dusky, with blue reflections. Ventrals with the rays blackish, the membranes bluish and gilt.

Measurements.

	Male.	Female.
	Times.	*Times.*
Head in length of body	5	4 5/16
Depth at ventrals in length	4 1/3	4 1/2
Maxillary in length of head	2 1/2	2 7/16
Longest dorsal ray in head	1 2/3	1 3/4
Ventral fin in head	1 1/4	1 2/7
Pectoral fin in head	1 1/3	1 1/3
Caudal lobes in head	4/5	1
Eye to first dorsal ray in head	1 7/8	2 1/8
Number of dorsal rays	62	60
Number of anal rays	27	29

CARANGIDÆ.

62. Oligoplites saurus (Bloch & Schneider). *Leather Jacket.*

Rather common about the wharves. Not used as food.

63. Caranx bartholomæi Cuv. & Val. *Yellow Jack.*
(*Caranx cibi* Poey; *Caranx beani* Jordan.)

Not very common; a young specimen taken in the seine.

Color in life deep bronze olive, darker than the adult fish, the ground color forming reticulations around blotches of light yellow. A dark bronze bar below eye. Fins yellowish.

64. Caranx chrysos (Mitchill). *Runner.*

Rather common; brought in by hook-and line fishermen. Specimens less golden in color than usual with this species.

In life dull green above, silvery below; fins all pale; opercular spot obscure; axil dusky; iris greenish-yellow. Some specimens showed faint yellowish shades below and traces of faint darker cross shades.

65. Caranx latus Agassiz. *Horse-eye Jack.*
(*Caranx fallax* Cuv. & Val.)

Very common; the young taken in seines along the shore; the adult swimming in considerable schools, and often taken with hook and line from the wharves.

Color in life silvery; olive above, scarcely tinged with golden below; iris coppery, the adipose eyelid very large, and covering its posterior half. A very small, but distinct black opercular spot. A distinct shade of dusky on lower part of pectoral toward the base, suggesting the black pectoral spot of *C. hippos*. Caudal rather bright yellow; other fins plain grayish; soft dorsal and caudal edged with darker. Ventrals white. This species rarely exceeds 15 inches in length.

66. **Caranx hippos** L. *Jack.*

Common in the deep waters, and taken with hook and line. This species reaches a length of 3 to 4 feet, and is a food fish of fair quality.

67. **Caranx crinitus** Mitchill. *Sunfish.*

A single specimen about 15 inches long obtained. The species is not uncommon.

68. **Selene vomer** (L.) *Moonfish.*

A single young specimen of the style known as "*Argyriosus vomer*" obtained. Probably not uncommon.

69. **Seriola lalandi** Cuv. & Val. *Amber Jack.*
(*Seriola gigas* Poey.)

Rather common; a food-fish of some importance; taken with the trolling-line. Numerous large specimens (20 to 30 pounds) seen, and one small one obtained. It is said to reach a weight of 100 pounds.

Coloration essentially as in *S. dumerili*. Dorsal fin dusky, with a light yellow submarginal band. Pectoral dusky yellowish; ventrals yellow and blackish; anal blackish, with pale edge. Young and old specimens have essentially the same general form, being at all stages more slender than *S. dumerili*.

Depth, $3\frac{3}{4}$ to $4\frac{1}{4}$ in length; head, $3\frac{1}{2}$ to $3\frac{3}{4}$. Soft dorsal, 1, 34; A. 1, 21. Dorsal lobe, $2\frac{1}{3}$ in head. Maxillary, $2\frac{1}{5}$.

70. **Seriola dumerili** (Risso). *Almicore; Amber fish.*
(? *Trachurus aliciolus* Rafinesque, 1810.
Trachurus fasciatus Rafinesque, 1810.
Caranx dumerili Risso, 1810.
? *Seriola semicoronata* Poey, 1860.)

Rather less common than the preceding, and reaching a smaller size.

Color in life pale grayish, silvery below; a gilt band through eye to base of caudal; another through temporal region to front of soft dorsal. No traces of dark cross bands; fins plain.

Body deep, robust, not strongly compressed; mouth larger than in *S. dorsalis*, about as in *S. lalandi*, the maxillary reaching middle of pupil, $2\frac{1}{6}$ in head; lobes of dorsal and anal low, not quite half length of head; nape scarcely carinated.

Head, $3\frac{1}{10}$ in length; depth, 3. D. 1, 32; A. 1, 21; length of specimen described, about 2 feet. Specimens apparently of this species have been obtained by Professor Gilbert at Aspinwall.

The species of this genus are very closely related, and many of those current are very doubtful. Omitting all discussion of those described from farther south, I venture on the following analysis of the species of *Seriola* recorded from the United States. It may be that some of these are really not distinct from others, but at present I think them all valid:

a. Dorsal and anal fins little elevated, the height of their anterior lobes less than half depth of body.

b. Head longer than deep.

c. Soft dorsal very long, its rays 36 to 38; maxillary reaching middle of orbit.

d. Body deep; depth 3 to 3½ in length; nape carinated; black cross bands permanent. Cape Cod to Cape Hatteras.....ZONATA.

dd. Body comparatively slender, its depth 3⅞ to 4 in length; nape, in adult, rounded; cross bands fading with age. Cape Hatteras to Texas and southward?.....CAROLINENSIS.

cc. Soft dorsal shorter, its rays 31 to 36.

e. Mouth comparatively large; the maxillary 2 to 2⅖ in head, reaching about to middle of pupil; nape rounded in adults; cross bands present only in very young.

f. Body slender, its depth about 4 in length; head 3½ to 3¾ in length; soft dorsal 32 to 34. West Florida to Brazil.....LALANDI.

ff. Body comparatively deep, its depth about 3 in length; head 3$\frac{1}{10}$; soft dorsal rays 30 to 32. Florida Keys to West Indies and Mediterranean Sea.....DUMERILI.

ee. Mouth smaller; the maxillary 2⅜ in head, barely reaching front of pupil; body rather slender, the depth 4 in length; soft dorsal rays 34 to 36; caudal fin yellowish. Point Concepcion to Cape San Lucas.DORSALIS.

bb. Head deeper than long; body banded at all ages, the bands narrow, arranged in pairs; soft rays of dorsal 30. South Carolina to West Indies.....FASCIATA.

aa. Dorsal and anal fins much elevated, their anterior lobes more than half depth of body; body compressed, the back elevated, the occiput somewhat carinated; soft dorsal rays 29 to 31.

g. Body moderately deep; the greatest depth 3⅖ in length (4 in total); temporal band pale yellowish-brown. West Indies, north to Pensacola.....FALCATA.

gg. Body very deep; the greatest depth 3⅓ in total length; temporal band nearly black. Mediterranean to Buenos Ayres and Florida Keys.....RIVOLIANA.

All the above except *S. fasciata* and *S. riroliana* have been collected and studied by the writer. These two I have never seen.

71. Trachynotus carolinus (L.). *Pompano.*

Not very common; one specimen obtained. As elsewhere, highly valued as a food-fish, but irregular in its appearance.

72. Trachynotus rhodopus Gill. *Permit.*

(*Trachynotus rhodopus* et *nasutus* Gill.; *Trachynotus goreensis* Goode & Bean, not of C. & V.; *Trachynotus carolinus* Poey.)

Not very common; only young ones obtained. These taken with the seine in the surf. This species reaches a larger size than the other American Pompanoes. Its common name, "*Permit*," seems to be a corruption of the common Spanish name "Palometa." The drawings made

by Poey of the species called by him *Trachynotus carolinus* have been examined by me. They represent this species. The occurrence of *T. carolinus* in the West Indies seems uncertain.

73. Trachynotus rhomboides (Bloch).

Many young specimens taken with the seine in the surf.

Silvery, the very young dusky; soft dorsal tipped with black; ventral spines and anal lobe deep orange; eye pale orange.

The young of *T. rhodopus* are similarly colored. The latter species is, however, at all ages, much more elongate.

74. Trachynotus glaucus (Bloch.) *Old Wife.*

One adult specimen taken; not very common.

POMATOMIDÆ.

75. Pomatomus saltatrix L. *Blue-fish.*

Not considered common: a few specimens seen; taken in the channels with the hook.

SERRANIDÆ.

76. Epinephelus* falcatus (Poey). *Scamp.*

A common food-fish, reaching a smaller size than most of the related species. Held in high esteem as food. Florida specimens (Key West, Pensacola, &c.) are more spotted in color and have the canine teeth more nearly vertical than Cuban examples. In the typical *falcatus* the upper canines are directed strongly forward, the lower correspondingly backward.

77. Epinephelus microlepis (Goode & Bean). *Gag.*

Abundant: reaching a weight of 30 to 40 pounds. Universally known as "Gag" at Cedar Keys and Key West. Has this name any connection with the Spanish name Aguaji?

78. Epinephelus bonaci (Poey). *Black Grouper*

Equally abundant with the preceding, and reaching a similar size. The young are frequently taken near shore.

79. Epinephelus venenosus (L.). *Rock-fish; Yellowfin Grouper.*

Two large specimens taken; not abundant; said to reach a weight of over 50 pounds.

80. Epinephelus itaiara (Lichenstein). *Jew-fish; Guasa.*

One young specimen obtained; a very large one examined. This species reaches a weight of 500 to 700 pounds.

81. Epinephelus morio (Cuv. & Val.). *Red Grouper.*

The most abundant of the Serranoid fishes, and, next to *Hæmulon plumieri*, the commonest market fish at Key West. Rarely exceeds 15 pounds. Found in rather deep water.

* As the species of this genus form the subject of a separate paper by Mr. Swain and myself, I refer to them here only briefly, and without discussion of the synonymy.

82. Epinephelus striatus (Bloch). *Nassau Grouper.*

Similar to the preceding in size and habits, and not much less abundant. Most seen in the markets are small.

83. Epinephelus ascensionis (Osbeck). *Rock Hind.*

Three seen; said to be much superior to the others (except *E. falcatus*) as a food-fish. Most of the species have tough white flesh, which is rather coarse.

84. Epinephelus guttatus (L.). (Lacépède). *Coney.*

Three specimens taken; a small fish, rarely exceeding a foot in length. No specimens of the crimson variety (*apiarius*, Poey) were seen at Key West.

85. Serranus formosus Linnæus. *Sand-fish.*
(*Diplectrum fasciculare* Auct.)

Rather common; taken in the seine and with the hook. The characteristic division of the preopercle into two clusters of spines is not seen in the young.

Color olive brown above, silvery below, with tinges of golden; sides with narrow horizontal stripes of blue, bright above, pearly whitish below; six of these present, with another at base of dorsal; a broken median stripe before dorsal; stripes on head bright blue; spinous dorsal with two stripes of light blue bordered with darker, and three of light orange-yellow; three blue stripes and four yellow ones on soft dorsal; caudal with light blue reticulations around light orange spots; ventrals and anal bluish white, shaded with light yellowish; pectoral transparent; posterior part of mouth tinged with yellow.

SPARIDÆ.

86. Lutjanus* chrysurus (Bloch). *Yellow-tail Snapper.*

A common food-fish, reaching a weight of 5 or 6 pounds; the adult taken in the channels with the hook, the young with the seine near the shore.

87. Lutjanus synagris (L.). *Lone Snapper.*

Still more common than the preceding, reaching a smaller size than any of the other snappers (2 to 3 pounds). The young are very abundant about the shores and wharves.

88. Lutjanus analis (Cuv. & Val.). *Mutton-fish.*

Rather less common than either of the preceding, and reaching a larger size (8 to 12 pounds). It is found with *L. chrysurus*.

89. Lutjanus campechianus Poey. *Red Snapper.*

Taken in deeper water than the others; shipped in large numbers to the Havana market in live-boats; reaches a weight of 15 to 20 pounds, but the average is not much above 10.

*The genera *Lutjanus*, *Hæmulon*, and *Calamus*, being made the subjects of special papers, are only briefly treated here.

90. Lutjanus caxis (Bloch & Schneider). *Schoolmaster.*

Rather common, mostly in shallow water; few large specimens seen, and none over 5 pounds in weight.

91. Lutjanus jocu (Bloch & Schneider). *Dog Snapper.*

With the preceding and less common. The two are doubtfully distinguished by most fishermen, and the name *Schoolmaster* is often given to either without discrimination.

92. Lutjanus caballerote (Bloch & Schneider). *Gray Snapper; Mangrove Snapper.*

The most abundant of the snappers and one of the most important food-fish. It rarely exceeds 8 pounds in weight. The young abound everywhere near the shore, and are taken with hooks or with seine. They are particularly numerous in the mangrove bushes which grow in shallow water about the Keys; from this habit comes the name of Mangrove Snapper, which is given to this species in localities much farther north than the mangrove grows.

This species has been wrongly called *Lutjanus caxis* by most recent American writers.

93. Hæmulon plumieri (Lacépède). *Common Grunt; Sow Grunt.*
(*Hæmulon formosum* Cuv. & Val.)

Very common everywhere; the most abundant food-fish at Key West, the amount consumed in the market exceeding that of all the other "bottom-fish" combined. It reaches a weight of 4 or 5 pounds, but most do not exceed 1 pound. By some fishermen it is thought to be the female of the yellow grunt, and is therefore called by them "Sow Grunt," the other being known as "Boar Grunt."

94. Hæmulon sciurus Shaw. *Yellow Grunt.*
Hæmulon elegans (Cuv. & Val.)

Rather common, the young taken about the shores, the adult in deeper water, with the preceding.

95. Hæmulon gibbosum (Bloch & Schneider.) *Margate-fish.*

In deeper water; not very common. Much the largest of the Grunts, reaching a weight of 10 or 12 pounds. The name "*Margate*-fish" is very old; I cannot guess its origin. "*Maggot-fish*," a name given by Schöpf, is evidently the same.

96. Hæmulon parræ (Desmarest.) *Sailor's Choice.*

Common; the young very abundant along the shores.

97. Hæmulon flavolineatum (Desmarest.) *French Grunt; Open-mouth Grunt.*
(*Hæmulon heterodon* Cuv. & Val.)

Not common; but one specimen taken.

98. Hæmulon aurolineatum (Cuv. & Val.). *Tom-tate.*
(*Hæmulon chrysopteron* Cuv & Val.)

Rather common; the young very abundant along the shore, and taken readily with hook and line. This species rarely exceeds a pound in weight.

99. Hæmulon tæniatum Poey.

Not very common; taken with the seine along the shore. The smallest species rarely exceeding 6 inches in length.

100. Pomadasys virginicus (L.). *Pork-fish.*

A common food-fish, taken with hook and line. It reaches a weight of about 2 pounds.

Oblique bar from nape through eye, and vertical bar downward from dorsal jet black; space before the anterior bar deep yellow; interspace between bars pearly gray, with yellow spots, the spots confluent above into a yellow area; ground color of body plain pearly gray with about seven deep yellow longitudinal stripes; the pearly interspaces not edged with darker and not distinctly blue; all the fins deep yellow; iris gilt gray.

A very young specimen showed the following coloration in life: Pale; anterior region from lower jaw and temporal region to spinous dorsal bright yellow; spinous dorsal, ventrals, and front of anal deep golden; other fins pale; a large round jet-black spot at base of caudal; a dark band from front of spinous dorsal downward, and two black stripes along sides, one from nape to last ray of dorsal and one from the eye nearly to the caudal spot.

101. Pomadasys chrysopterus (L.). *Whiting.*

(*Labrus fulvomaculatus* Mitchill; *Pristipoma fasciatum* Cuv & Val. *Orthopristis poeyi* Scudder.)

Not very common; apparently identical with specimens from Cuba, and with others from Cedar Key and other more northern localities.

Color in life light bluish-gray, everywhere with iridescent reflections; sides with faint darker cross bars, which are scarcely visible; head grayish-blue; a small golden spot at point of junction of scales all over sides of body, these arranged in undulating rows which become straight on caudal peduncle only, where also they are somewhat confluent: fine spots on top of head, larger spots on sides of head, two of them before eye becoming oblique stripes; dorsal bluish-gray, with spots everywhere of bronze-brown; caudal bluish, its scaly portion with fine bronze spots; ventrals and anal whitish, the former dusky at tip; pectorals colorless; mouth yellow within.

102. Calamus pennatula Guichenot. *Little-head Porgy.*

A common food-fish, taken with hook and line in the channels. Grows to be little more than a foot in length.

103. Calamus calamus (Cuv. & Val.). *Saucer-eye Porgy.*

With the preceding; scarcely less common.

104. Calamus bajonado (Bloch & Schneider). *Jolt-head Porgy.*

One of the common food-fishes, more abundant than either of the preceding, and reaching a much larger size. Grows to a length of 2 feet. All are alike considered as food-fishes of fair quality.

105. Calamus penna Cuv. & Val. *Sheep's-head Porgy; Little-mouth Porgy.*
(*Calamus milneri* Goode & Bean).

The young very common, taken with seine along the shores; only a single adult specimen obtained.

106. Calamus arctifrons Goode & Bean. *Grass Porgy; Shad Porgy.*

Common, with the preceding; the adult often taken in the channels. The smallest of our species of *Calamus*.

107. Diplodus probatocephalus (Walbaum) *Sheep's-head.*

Rather rare; a few specimens seen.

108. Diplodus unimaculatus (Bloch.) *Bream.*
(*Sargus caribæus* Poey.)

A few specimens 6 to 8 inches in length, taken with the seine along the shore. These are identical with specimens obtained in Cuba.

Bluish silvery in life, with faint traces of six dark vertical bars, the second of these forming a rather conspicuous dark humeral spot. Below the lateral line six horizontal golden stripes, narrower than the interspaces; about four stripes above the lateral line, these more broken and irregular, especially anteriorly; gilt shades on cheek and nape; dorsal plain, its edge dusky; pectoral and caudal plain light-yellow; ventral reddish-orange (dusky in some specimens—males, according to Poey), anal slightly yellowish.

This species is closely related to *D. rhomboides*, having, like the latter, emarginate incisors. Its coloration is darker and more golden than that of *D. rhomboides*, its body is deeper; the dorsal spines are constantly thirteen instead of twelve, and the second anal spine is longer than in *D. rhomboides*, its tip extending when depressed beyond the tip of the third spine.

109. Diplodus rhomboides (Linnæus). *Bream.*

With the preceding, rather more common, but far less abundant than farther north.

Olivaceous, the sides bluish-silvery; a humeral spot and traces of six vertical bars; gilt stripes much less intense than in *D. unimaculatus*, much broader than the interspaces; about seven stripes below the lateral line, those above it more or less confluent; dorsal fin pale-bluish, with a submedian gilt band and a gilt edging; caudal yellow, faintly barred; anal bluish, with a median yellowish band; ventrals mesially yellowish; pectorals plain.

110. Cyphosus bosqui (Lacépède.) *Chub.*

A valued food-fish. Not very common, but one specimen being obtained—an unusually large one for this species.

Color in life steel-gray, very slightly bluish, not much paler below; the edges of each row of scales on back and sides slightly brassy, so that very faint yellowish stripes alternate with bluish ones of about equal width; diffuse pale stripe below eye, a yellowish one above and

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below this; fins all dull grayish; ventrals and anal somewhat blackish; edge of opercle slightly darker.

MULLIDÆ.

111. Upeneus balteatus Cuv. & Val. *Goat-fish.*
(*Upeneus flavovittatus* Poey.)

A single, nearly adult, specimen taken in the seine. It agrees fully with others from Havana.

Color in life flesh-color above, sides silvery, tinged with yellowish below (entire body becoming crimson on immersion in spirits); edges of scales of back light olive-green; top of head quite rosy; a bright yellow band from eye to base of caudal, about as wide as pupil and a little above axis of body; a whitish streak above and below this; another above lateral line; a yellow stripe along snout; yellow shades below eye; barbels flesh-color; both dorsals and caudal bright yellow; ventrals and anal pale yellow; pectoral flesh-color; anterior and posterior edges of opercle edged with yellow; iris red.

This species belongs to the subgenus *Mulloides*, having the teeth bluntish, strong, in several series.

112. Upeneus maculatus (Bloch.) *Goat-fish.*

Numerous young specimens taken with the seine in the surf.

Color, olive above, pearly below, the sides faintly yellowish and everywhere more or less flushed with pale red (body becoming crimson on immersion in spirits); the red shades generally more distinct after death; scales above considerably tinged with red, their edges greenish; some three to five obscure dark blotches on sides along lateral line; one under each dorsal fin more distinct than the rest and about as large as eye; a bright greenish spot on each scale of the row above lateral line on the middle of back, these forming a short series; three narrow stripes of light greenish from eye forward and two backward, the lower passing under the eye and merging into the lower anterior stripe; snout reddish; barbels orange, yellow at tip; dorsal mottled with orange-brown, its tip yellowish; soft dorsal pale-yellowish, with two black blotches; caudal pale at base, then yellowish, the tips of the lobes pale orange; anal pale reddish; ventrals light reddish, mesially blackish.

SCIÆNIDÆ.

113. Menticirrus saxatilis (Bloch & Schneider).
(*Menticirrus nebulosus* (Mitchill).)

Numerous young specimens taken with a seine in the surf. These are evidently identical with a fish taken at Pensacola in 1881 by Jordan & Stearns, and referred to *Menticirrus nebulosus*. These are darker in color than specimens from the North, but in other respects I am unable

to see that they differ at all from the common "king-fish" of the North, to which species we therefore refer them.

Color in life, of largest specimen (about 4 inches long), gray, tinged with bronze and profusely dotted with black: a band of dark olive between eyes: two downward and backward at nape below dorsal; a broad dark band downward and forward from last dorsal spines to ventrals, involving last half of spinous dorsal. Two stripes downward and forward from soft dorsal, one forming a black spot on the middle of the fin; a horizontal band of similar color on posterior part of body, extending along lower lobe of caudal; ventrals and base of anal black; other fins pale except on the black areas; inside of opercle whitish, with blackish dots.

Smaller specimens are more nearly uniform bronze-black.

The scarcity of Sciænoid fishes is one of the most remarkable peculiarities of the fauna of the Florida keys and Cuba. The family is well represented along the coasts of the mainland. These fishes apparently prefer sandy shores to coral formations.

GERRIDÆ.

114. Gerres lefroyi (Goode).

Not rare in the surf. A considerable school taken at one time with the seine. One of the smaller species, rarely exceeding six inches.

115. Gerres gracilis (Gill).
(*Eucinostomus pseudogula* Poey.
Eucinostomus harengulus Goode & Bean).

Rather common in shallow waters There is no doubt of the identity of Floridan and Cuban specimens. I see no difference between either and the *Gerres gracilis* of the Pacific coast.

116. Gerres gula Cuv. & Val. *Common "Shad."*
(*Diapterus homonymus* Goode & Bean;
Eucinostomus argenteus Baird & Girard;
Eucinostomus gulula Poey.)

Excessively common everywhere in shallow water. It reaches a length of four or five inches, and is used only for bait. In common with all the other species of the genus, this is known as the "shad."

117. Gerres cinereus (Walbaum). *Broad Shad.*
Gerres zebra Muller & Troschel.
Gerres aprion Cuv. & Val.

Rather common, taken with the seine in water of moderate depth, in company with species of *Mugil*. It reaches a length of about 15 inches, being the largest species of the genus. It is a food-fish of some importance at Key West.

Color in life, silvery, olivaceous above, sides with faint darker cross bars, most distinct in life: spinous dorsal and ventrals partly golden. Eye white.

118. Gerres olisthostoma Goode & Bean.

A single large specimen taken with hook and line from the wharf.

EPHIPPIDÆ.

119. Chætodipterus faber (Broussonet).

Apparently not common; a single young specimen obtained.

CHÆTODONTIDÆ.

120. Pomacanthus aureus (Bloch). *Black Angel.*

Rather common; frequently taken with spear or hook, not valued as a food-fish.

Adult specimens are grayish without tinge of yellow; the center of each scale blackish, the edge pearly gray. Head and vertical fins dusky gray, their tips blackish; a narrow yellowish bar near tip of caudal, followed by a dark streak; the tip of the fin whitish. Pectoral yellowish, especially its inner side and its basal half, its tip translucent. Lower jaw pale flesh-color. Ventrals brown, yellowish at tip.

Younger specimens have a whitish cross-bar on the anterior part of body, behind which are sometimes still others.

There is no doubt of the distinctness of this species from *P. arcuatus*, as has already been shown by Bleeker, Poey, and Lütken. *P. arcuatus* has ten dorsal spines, smaller scales and yellow cross-bands, and is as yet unknown from the coast of the United States.

121. Holacanthus ciliaris (Linnæus). *Yellow Angel.*

Rather common, the young abundant among the rocks; the adult often taken with the spear. Not much valued as a food-fish, probably because of some prejudice, as the flesh is said to be very good.

Color in life, yellowish brown on sides, each scale with a darker or orange spot. Back above, shaded with violet, which grows brighter above and merges into intense sky-blue along the edges of the spinous dorsal and on the region before the dorsal; scales of dorsal region with brown spots like those on the sides. Head paler, the upper lip yellowish; lower jaw reddish. Spines of preopercle and edge of opercle very bright sky-blue. Iris yellow, marked above and below by blue. Top of head bluish green. Breast sky-blue, paler anteriorly, the color fading before the vent. Pectoral sky-blue at base, then broadly golden, its edge pale; axil and inner side of pectoral golden. Ventrals golden. Blue margin of dorsal edged below by dull orange, its posterior edge and produced lobe golden yellow. Caudal colored like body, its edge broadly golden-yellow. Anal colored like soft dorsal. Traces of a brownish spot, surrounded with blue at the nape.

There seems to be no sufficient reason for setting aside the name *ciliaris* for this species in favor of the later *parræ* of Bloch. It is true that Linnæus confounded other species with his *ciliaris*, but the species which he seems especially to have had in mind is apparently the present one.

ACANTHURIDÆ.

122. Acanthurus chirurgus (Bloch). *Tang.*

Common, the young taken with the seine along the shore; the adult with the hook in the channels.

Adult olive-brown, more or less distinctly greenish; middle of sides paler; breast tinged with blue; sides with about twelve distinct blackish vertical bars, rather narrower than the interspaces, most distinct over front of anal; a bronze-olive stripe along base of dorsal; head olive, slightly tinged with blue on the preorbital; lips light bluish; edge of opercle dusky; four or five yellowish streaks extending across eye, obliquely upward and backward; region at base of caudal spine blue-black, the black surrounded by a sky-blue ring; a pale olive ring around base of caudal.

Spinous dorsal with alternate stripes running upward and backward, of dark blue and bronze-olive, the two colors of about equal width. Soft dorsal with a bluish streak on the front side of each ray and a bronze stripe behind it, the fin sometimes showing horizontal bluish streaks; anal similarly marked; edge of dorsal and anal narrowly sky-blue; caudal dark, tinged with blue; anal and ventral similar. Pectoral blue above, its median region washed with olive.

123. Acanthurus tractus Poey.

Several young specimens taken, apparently of this species. In life, olivaceous, with longitudinal reticulating lines of darker olive, very close set; stripes on fins nearly horizontal, distinct and parallel, similar and continuous on both the spines and the soft rays; caudal fin dull yellow-olive, the pale ring at its base faint; edge of opercle black. The caudal fin in these is much more deeply lunate than in either young or adult of *A. chirurgus*, the depth of the emargination in both species increasing with age.

124. Acanthurus cœruleus (Bloch). *Blue Tang.*
(*Acanthurus brevis* Poey).

A single young specimen apparently corresponding to the *Acanthurus brevis* of Poey, obtained. "*Blue Tangs*" are occasionally taken, according to the fishermen.

Color light olive, with narrow, horizontal, wavy streaks of darker olive, slightly tinged with bronze, these rather conspicuous and very numerous. Belly livid bluish; a whitish ring at base of caudal; edge of opercle blackish; a faint blue stripe and some orange before eye. Both dorsals pale bright orange, with six stripes of light slaty-blue, continuous and horizontal on both parts of the fin; edge of dorsal light blue, its base orange; caudal dull yellow with a whitish edge. Anal marked like dorsal, but the bluish darker and the pale color dull yellowish-brown, the edge of the fin dusky. Ventrals violet, blackish at tip. Pectoral light yellow; caudal spine yellow.

This differs from adult specimens from Cuba only in the ground color,

which probably changes gradually to blue with age. The adult of *cæruleus* is washed everywhere on body with clear bright violet-blue, very bright on the pale streaks and markings on body and fins. Fins largely bronze-brown; caudal mesially light yellowish.

POMACENTRIDÆ.

125. Pomacentrus leucostictus Müller & Troschel.

About rocks and reefs in clear, rather deep water; not rare.

Color in life, dark olive-brown anteriorly, clear yellow, with pearly reflections on sides and below; the caudal peduncle and fin rich golden-yellow. Head olive above, golden below, the colors changing insensibly. Head with numerous spots of dark blue, closer set above; those before eye and on snout oblong, stripe-like. These spots appear black in life, but in spirits they become intense sky-blue, and ultimately fade to whitish. Each scale of back above lateral line anteriorly with a vertically oblong stripe of dark blue. Behind and below these, many scales have each a round point of deep violet. One row of these on upper edge of caudal peduncle on each side, and three partial series below lateral line. Dorsal bluish-black, each scale with a blue point. Last rays of soft dorsal yellow; a black point at base of last ray. A large blackish blotch on middle of first soft rays. Spinous dorsal with a marginal pale band made of two narrow stripes of bluish, and two of dull orange. Anal golden yellow, its edge dusky, traces of a pale spot at base of last ray. Pectoral yellow, a conspicuous blue spot at base above. Ventrals yellow, tinged with bluish. A blackish blotch on middle of base of lower jaw.

126. Pomacentrus obscuratus Poey.
(? *Pomacentrus atrocyaneus* Poey).

Not rare; in the same localities as the preceding.

Males sooty blue-black in life, not paler below; each scale of back and sides with an inconspicuous bronze-olive spot. A faint paler band around caudal peduncle. Head with small spots of sky-blue, those before eye oblong. Iris blue and gilt. Spinous dorsal with blue and with bronze spots. Soft dorsal with fine blue points. Dorsal with a submarginal band of paler; this band on spinous dorsal formed of two oblique yellowish stripes with a bluish stripe between them. Caudal black, paler at tip, its base with blue spots. Anal black, with blue points at base. A whitish spot at base of last ray. A conspicuous black spot at base of upper pectoral rays. No black blotch on back of tail. Other specimens (females?) are paler, with faint blue spots on scales of sides, and no blue spots on head or pale spot on anal.

Body rather deep, the anterior profile much convex; interorbital space strongly convex; eye longer than snout, 3½ in head. Preorbital and preopercle sharply serrate. Caudal well forked, the upper lobe the longer, especially in males. Lower limb of preopercle scaly. Head 3⅓;

depth 2 ($2\frac{3}{5}$ in total), D. XII, 14; A. II, 12; Scales 3—28—10. Length 4 inches.

This species is apparently closely related to *P. fuscus* Castelnau and to *P. atrocyaneus* Poey: the latter species is said to have the depth 3 in total length, while the former is described as having the preorbital and preopercle weakly serrate, and a black blotch on the back of the tail.

127. Glyphidodon saxatilis (L). *Cock-eyed Pilot.*

Common about rocks and in tide-pools.

LABRIDÆ.

128. Lachnolæmus suillus Cuvier. *Hog-fish.*
(*Lachnolæmus falcatus* Cuv. & Val., not *Labrus falcatus* L.)

A common food-fish, reaching a weight of six or eight pounds. The flesh is white and considered good, although less valued at Key West than in some other regions.

The variations in the ground color are considerable, older fishes and fishes taken in deep water being much redder than small fishes or fishes taken from grassy bottoms. One of the latter, one foot in length, was gray, violaceous above, each scale olive-green at base. Lower parts tinged with creamy-orange. Head more purplish, mottled with olive. Cheeks greenish. An undulate blue line below eye, below which are purplish reticulations. Long spines of the dorsal fin greenish at base, orange at tip. Soft dorsal similar, a large black blotch at its base. Caudal grayish, with three rows of dull olive spots. Anal similarly colored; pectoral light orange. Ventrals blackish at tip, reddish at base.

Deep-water fishes are brick-red or orange red, the degree of redness being very variable, the markings constant. The adult male has further the vertical fins all blackish at base, the black forming a crescent on the caudal; frontal region from snout to occiput abruptly blackish; lower jaw light yellow. The male fish has the cleft of the mouth very much wider than the female. These large-mouthed hog-fish are thought by many fishermen to belong to a different species. One specimen had four elongate spines in the dorsal.

We have little doubt that Professor Poey is right in referring all the nominal species of *Lachnolæmus* to one, and in retaining for this one the name *L. suillus* of Cuvier, instead of that of *falcatus* L., used by Valenciennes.

The *Labrus falcatus* L. is described as follows:

"Falcatus, .0. L. prima dorsali analique radiis quinque primis inermibus falcata. D. $\frac{7}{27}$; P. 17; V. 5; A. $\frac{3}{26}$; C. 20.

"*Habitat:* In America. *Mus. De Geer. Corpus latitudine Brama, argenteum.* Radius primi e mollibus dorsalis analisque elongati, sequentibus, unde hæ pinnæ falcatæ, dentes acuti. Pinnæ ventrales parvæ."

I see no reason for thinking this a *Lachnolæmus* at all. It is much more likely to have been a *Trachynotus*. So far as it goes, it agrees fully with *Trachynotus rhodopus*.

129. Platyglossus radiatus (Linnæus). *Pudding-wife.*

(*Labrus radiatus* L., Syst. Nat. ed. x, 1758, 288 (based on a figure by Catesby; not *Sparus radiatus*, L. ed. xii.)

Platyglossus cyanostigma, (Günther, iv, 161.)

Rather common, reaching a much larger size than any other of the American *Platyglossi*, and therefore a food-fish of some importance. The largest seen are about 20 inches in length.

This is the species which should retain the Linnæan name *radiatus*. The *Labrus radiatus* of the tenth edition of the Systema Naturæ, based on a figure of Catesby, is this fish. The *Sparus radiatus* of the twelfth edition, described from a specimen sent by Dr. Garden from Charleston, is *Platyglossus bivittatus*.

In life the female of the "*Pudding-wife*" is of a rich translucent bronze olive, the belly becoming of a livid pearly blue, tinged with creamy orange. A quadrate area before dorsal yellowish green, with abrupt edges and bounded by blue lines; three whitish saddle-like blotches below dorsal fin; a yellowish area on back of tail; top of head orange olive, with three rows of clear blue spots; a blue stripe from nape through upper part of eye to snout; a wavy stripe of blue just below eye; temporal region with curved streaks of bright blue; lips mostly blue; cheeks nearly plain; opercle light orange, with dashes of blue and violet, but without well defined spots; middle of lower jaw light blue; a longitudinal streak on lower part of cheeks; lower jaw light orange, with two blue cross-bands; interopercle with a blue stripe; axil green; a yellowish green shade from pectoral to caudal; a deep blue spot at upper base of pectoral; two broad orange bars downward and backward from pectoral, the interspaces blue; each scale on body with vertical spot of a vivid blue; on caudal peduncle these spots are brighter, becoming round below and horizontally oblong above; some of them on base of anal confluent in lines; mouth and gill-cavity within white (livid blue in male).

Dorsal orange; a broad blue marginal stripe; a blue stripe at its base, interrupted behind; besides these a mesial stripe, breaking up posteriorly into about three rows of irregular curved spots. Caudal orange, broadly tipped with yellow, its outer rays blue, its basal part with many irregular spots of light blue. Anal with a basal row of blue spots, then an orange band, then a narrower stripe of bright blue, then a broad yellow band, then a row of blue spots, then orange, then an edge of sky blue. Pectoral translucent, shaded with blue and some pale orange. Ventral with the spine and first soft ray blue, the membrane orange, the fin otherwise translucent.

Male fish largely olive, the lower parts deep bluish green; a bright orange olive area behind opercle, then a blue cross band with indefinite

edges at vent, the rest of the body tinged with golden, the part above axis of body more or less orange brown; the whole upper half of body shows more or less orange shading. Breast blue-green. Blue spots on scales less pronounced than in the female. Head livid blue-green, more or less striped and spotted with clear blue, the spots arranged as in the females, but less sharply defined. Orange stripes and areas on top and front of head as in female, but the blue areas larger and more encroaching.

Dorsal and caudal alike in both sexes, the blue more pronounced in male. Anal alike in both, but in the male the median stripe is of a rich grass green. Pectoral in male with blue rays and bright grass-green membranes. Ventrals similar, but the inner rays green. Blue spot at base of pectoral above very intense. Oblique bands from pectoral downward and backward similar in both sexes. Blue under lower jaw and middle of breast similar.

Lower pharyngeal T-shaped, not much broader than long.

130. Platyglossus bivittatus (Bloch). *Slippery Dick.*

(*Sparus radiatus* Linnæus, Syst. Nat. ed. xii, 1766, 472, on a specimen sent from Charleston by Garden.)

(*Platyglossus humeralis, grandisquamis* and *florealis* of authors.)

Exceedingly common in shallow waters and about rocks. It rarely reaches the length of a foot. Its markings are quite constant, but the ground color is subject to much variation. All the specimens obtained in Cuba are light olive, much paler than any taken at Key West, but the markings are precisely the same. The changes due to age are considerable. This fish is often caught by boys with small hooks. It is known as *Slippery Dick*. With *Synodus spixianus*, it is also often called *Soap-fish*. It is not brought into the markets.

Greenish above, sides shaded with purple, the purplish color extending on the back where it forms about ten dark bars. Young specimens with a brownish lateral band and a reddish stripe above it and below it.

Many scales of posterior part of body, each with a vertical spot of deep greenish blue; these smallest and bluest on caudal peduncle. Blue, red, and greenish shades extending downward and backward from pectoral. A red band from each eye, these meeting on the nape; each bordered before with blue, behind confluent with a median reddish vertebral stripe which extends to front of dorsal. Snout largely red; frontal region green; a red band through snout to edge of opercle edged by blue below, then yellowish and again red. Lower jaw with two orange red bands, its middle red in front, blue behind. Throat reddish. Opercle with a violet spot edged by green and orange. Beyond this is a <-shaped violet mark edged behind with yellow. Dorsal bluish at base, then red, yellowish, red, and pale. Sometimes, but not always, a violet spot at base of its last ray. Caudal largely red, with oblique bluish and yellowish stripes, the corners more or less bluish, darkest in the adult; anal like dorsal. Ventrals redish; pectorals plain.

131. Xyrichthys rosipes Jor. & Gilb.

Two young specimens taken with the seine in the surf.

132. Doratonotus thalassinus Jor. & Gilb.

One specimen taken with the seine in eel-grass. The most exquisitely colored fish seen at Key West.

133. Scarus guacamaia Cuvier. *Parrot-fish.*

Rather common in rocky places. It reaches a length of 15 to 18 inches, being larger than any of the other species.

134. Scarus cœruleus Bloch.

One young specimen taken; adult specimens, deep blue in color, are said to be frequently taken, but none were seen by me.

135. Scarus croicensis (Bloch).
(*Pseudoscarus sanctæ-crucis* Gthr.)

A few young specimens taken.

136. Scarus flavescens (Bloch & Schneider.)
(*Scarus squalidus* Poey.)

The most abundant species of the genus; found everywhere in eel-grass and algæ. It rarely exceeds 10 inches in length. Like the other members of the genus, it feeds on algæ, and from the softness of its flesh it is rarely brought into the markets, although it has not a bad flavor.

137. Sparisoma cyanolene Jordan & Swain.

Common with the preceding, but smaller in size, the largest, sexually mature, rarely exceeding 6 inches.

138. Sparisoma xystrodon Jordan & Swain.

Common with the preceding, and still smaller, the females with spawn at a length of 4 inches.

139. Cryptotomus beryllinus Jordan & Swain.

Not rare in eel-grass. It reaches a length of about 10 inches.

SCORPÆNIDÆ.

140. Scorpæna plumieri (Bloch).

Scorpæna bufo Cuv. & Val.
Scorpæna rascacio Poey.

Rather common; the young taken with the seine near the shore; the adult taken with the hook in deeper waters. The species is held in great dread in common with the other species of the genus and *Batrachus tau*, by the fishermen on account of the poisonous properties of the dorsal spines. It is rarely used for food.

The coloration is highly variegated, and is subject to much variation. The species may be always known by the presence of large white spots in the jet-black ground color of the axil.

In life sand color, with two broad blackish shades on the body and one on the head; the belly purplish; the lower side of head finely speckled in all shades of light, dark, and pearly-bluish: upper parts covered with whitish cirri and profusely speckled, the surface looking as though covered with sand; eye with radiating dark spots; dorsal colored like body, with some well-marked whitish spots; second dorsal encroached on by the dark band on the body below it; caudal variously mottled, with three black and three pale bands; anal whitish, variegated with reddish and black; ventral similar, but with more maroon-red; pectoral still more variegated, the tip scarlet shaded; inside of pectoral largely bright yellow, then blackish, tinged with cherry-red; axil jet black, with large round white spots; lips barred with black and whitish; membranes and angle of mouth light bright yellow.

Some specimens, especially old ones, taken in red algæ, are largely scarlet on body and fins.

141. Scorpæna stearnsi Goode & Bean.

Numerous young specimens taken with the seine in eel grass. Olive above, bluish below, considerably mottled, and with pale dermal flaps, which give the body a sanded appearance. Two faint dark shades on body; vertical fins all dotted with white; anal with same, dusky; caudal tipped with dark, and with a dark median band; some red on all the fins; ventrals red, tipped with blackish; pectoral much mottled, yellowish within; axil whitish, with numerous dark reddish-brown spots; cirri long, grayish, and mottled.

142. Scorpæna grandicornis (Cuv. & Val.).

Young specimens rather common in the eel-grass; no large ones seen.

In life gray, with faint cross shades of brown; numerous sulphur yellow spots scattered about on sides; sides with white dots; axil dark gray, with round white dots, each surrounded by a dark ring; pectoral with three blackish blotches above and one toward the base below, tinged with sulphur-yellow, especially on the inner side; supraocular filament very large ($1\frac{3}{8}$ in head), blackish, with gray fringes; spinous dorsal largely black; soft dorsal edged with dusky; anal with three black bands; caudal with two, besides a faint one at base; ventrals tipped with black.

Body rather deeper than in *S. plumieri*, its coloration less variegated; head and sides of body with dermal flaps; a slight depression below eye; occipital pit very deep; spines of head sharp; a few scales on opercle; breast with rudimentary scales; supraocular flap very long, broad, and fringed, more than half length of head, reaching to beyond front of dorsal; maxillary reaching posterior margin of eye, $2\frac{1}{3}$ in head; dorsal spines higher than in related species, the highest as long as the long second anal spine, and about half head.

Head, $2\frac{1}{2}$; depth, $2\frac{1}{4}$; D. XII, 9; A. III, 5; Lat. l. with about 26 pores.

This common West Indian species has not been previously noticed on our coasts.

The four species of *Scorpæna* found on the Florida coast are readily distinguished by the colors of the pectoral axil, as follows:

Plumieri: Axil jet black, with a few large white spots.

Grandicornis: Axil dusky gray, with numerous white stellate spots.

Stearnsi: Axil pale, with several round blackish spots.

Calcarata: Axil pale, with dark specks and a black spot above.

URANOSCOPIDÆ.

143. Astroscopus anoplus (Cuv. & Val.).

Two young specimens, each rather less than 2 inches in length, taken with the seine in eel-grass.

Color very dark olive, becoming jet black in spirits on upper part of body, lower jaw, and spinous dorsal. Belly and fins otherwise abruptly whitish; no pale spots anywhere.

Head very large, about as broad as deep; its upper surface rugose and entirely bony, except a small area along base of premaxillary in front. No naked areas behind or between the eyes. A transverse depression behind the eyes and before the occipital ridges; these ridges rather prominent, obtuse; a similar ridge (turbinal) above opercle, ending in a short, bluntish spine, which does not project beyond the opercle.

Humeral spine scarcely developed. Preopercle with two large bluntish spinous projections, the posterior largest, directed downwards and backwards, the other downwards and forwards. No spine on subopercle. No distinct spine on pelvis before ventrals. Cheeks covered by smooth skin, the preorbital forming a narrow bony ridge parallel with the maxillary. Suborbital very narrow; teeth rather strong; lips fringed. No intralabial filament. Maxillary reaching to below posterior part of eye. Scales very minute, scarcely appreciable even with the lens; traces of scales appearing only on the upper part of the sides. Caudal nearly as long as pectoral, $1\frac{1}{4}$ in head; head $2\frac{2}{3}$ in length; depth, $3\frac{1}{4}$. D. IV, 14; A. 13.

It is evident that these specimens belong to the species originally called *Uranoscopus anoplus*, by Cuv. & Val., and that it is specifically, if not generically, different from the fish which has been called *Astroscopus anoplus* by recent American writers.

In the complete armature of the top of the head this species agrees with *Uranoscopus*, while in most respects it approaches more nearly to the type of *y-græcum*, the genus or subgenus *Upsilonphorus*.

I have not the materials at hand for a general revision of the synonymy of these fishes.

At present, it would appear that three species are represented on our Atlantic coast, viz:

1. ASTROSCOPUS ANOPLUS (Cuv. & Val.).

   Charleston; Key West.

2. UPSILONPHORUS GUTTATUS (Abbott).

(*Astroscopus anoplus* Bean, Proc. U. S. Nat. Mus., 1879, 60.)

3. UPSILONPHORUS Y-GRÆCUM (Cuv. & Val.).

Astroscopus y grœcum Bean., Proc. U. S. Nat. Mus., 1879, 61.

Astroscopus anoplus Jor. & Gilb., Proc. U. S. Nat. Mus., 1882, 289 (Pensacola, young).

Astroscopus y-grœcum Jor. & Gilb., Proc. U. S. Nat. Mus., 1882, 610 (Charleston, adult).

The comparison between *A. anoplus* and *A. y-grœcum* by Jordan & Gilbert, l. c., 289, is valueless, as the specimens examined were respectively the young and the adult of *y-grœcum*. According to Dr. Bean, *Astroscopus guttatus*, of which he has examined both young and old, is distinct from *y-grœcum*. The adoption of the name *anoplus* instead of *guttatus* is, as we have seen, improper.

Both *Upsilonphorus* and *Astroscopus* are defined with perfect correctness by Gill (Proc. Acad. Nat. Sci. Phila., 1861, 113), except for the statement that in the latter the body is naked.

LEPTOSCOPIDÆ.

144. Dactyloscopus tridigitatus Gill.

Three specimens taken with the seine in the surf, on sandy bottom.

Pale sand color above, the lower parts whitish; above 12 narrow cross-bands of whitish on the back, not extending down far on the sides; head mottled above; fins all pale.

The pseudobranchiæ in this species are small, but evident. There is, therefore, no real difference between *Dactylagnus*, which has psuedobranchiæ, and *Dactyloscopus*, of which this is the typical species, and in which they were said to be wanting.

GOBIIDÆ.

145. Gobius soporator Cuv. & Val. *Rock-fish.*

(*Gobius mapo* Poey.)

Very abundant everywhere in the tide-pools and shallow waters.

146. Gobius stigmaturus Goode & Bean.

Two specimens taken with the seine in a shallow bay.

Very pale olive, everywhere freckled and spotty; lower part of sides silvery, crossed by faint and narrow cross streaks of light brown; sides with about five faint dark blotches; a dark blotch below eye and one on opercle; a round black spot at base of caudal; bars on vertical fins light olive.

Numerous other specimens are less freckled in coloration, and have a more diffuse caudal spot as well as a vague dark spot at the shoulder. The dusky marks on the sides are larger. I cannot find any other differences, and refer all of them to *G. stigmaturus*. The relations of *G. boleosoma*, *G. stigmaturus*, and *G. encœmus* are certainly very intimate.

147. Gobius encæomus Jor. & Gilb.

One small specimen taken with the seine in a shallow bay.

Light green, with five diffuse spots of darker green on sides, the posterior one most conspicious; pectorals, both dorsals, and caudal edged above with pale orange; ventrals mostly black, edged with paler; anal dark; a conspicious dusky shoulder-spot; maxillary reaching to below middle of eye; caudal about half longer than head. Lat. l. about 30.

This little specimen appears to be identical with that described by us from Charleston under the name of *Gobius encæomus*. The species is allied to *G. stigmaturus*, but has a much slenderer body. The number of scales in a lateral series is less than 37, the number originally stated by us. There are about 33 in this specimen.

148. Gobiosoma bosci (Lacépède).

One specimen taken with the seine in a shallow bay.

Pale olive with darker cross bands formed of dark dots; a row of dark dots along middle of side; vertical fins all mottled and faintly barred with dark olive; pectorals and ventrals nearly plain.

149. Gobiosoma ceuthœcum Jor. & Gilb.

One specimen found in the cavity of a sponge.

150. Eleotris smaragdus Cuv. & Val.
(*Erotelis valenciennesi* Poey.)

Two specimens taken with the seine among algæ.

Color in life very dark olive, almost black, the coloration formed by dark points, which are especially numerous on head and breast.

First dorsal olive and black; second, dusky olive, with about four horizontal blackish streaks; caudal blackish; anal olive, soiled with dark points; ventrals pale, with dark points; belly livid; pectorals light orange, with blackish points at base; some dark points behind eye.

Cuban specimens are rather paler in color, but are not otherwise different.

Head, 5½ in length; depth, 10 to 12. D. VI–1, 10; A. 1, 9; Lat. l. about 100.

This species differs very strikingly from *Eleotris gyrinus* in the extreme slenderness of its body. It is also strictly a marine species. On account of these peculiarities Professor Poey has made it the type of a distinct genus, *Erotelis*.

BLENNIIDÆ.

151. Cremnobates marmoratus Steindachner.

Rather common; several specimens taken with the seine in eel-grass.

Color in life of varying shades of olive-gray or sand color, with a series of whitish blotches on head and along sides; markings on dorsal and

anal whitish: two dark blue ocelli on dorsal and one on anal, these edged with orange and interiorly with black; ventrals, pectorals, and caudal whitish, barred with clear orange-red; first dorsal black at tip; a curved blackish line at base of caudal; lower side of head yellowish-brown, with whitish bands.

152. Cremnobates fasciatus Steindachner.

With the preceding; smaller and less abundant.

In life light pinkish-brown, much mottled, and with traces of six to eight faint darker bars; head and its cirri above whitish; three blackish spots behind eye, radiating from it, the lower one largest; preopercle with three dark dots; dorsal pale, with nine blackish blotches, in the next to the last of which is a large blue-black ocellus, edged with orange; anal with five dark blotches and no ocellus; a blackish bar across base of caudal; rest of caudal and pale part of anal with dark dots; ventrals whitish, barred with black; pectoral similar, its base with a whitish area, which has a brown center, below which is a small black spot.

153. Cremnobates affinis Steindachner.

One specimen taken with the preceding.

Its coloration is much more uniform, the body being almost uniform dark brown; dorsal and anal black; caudal pale; side and lower part of head each with a large whitish area; pectorals pale, banded; dorsal with a single ocellus; anal with none.

154. Cremnobates nox Jor. & Gilb.

One specimen taken with the seine.

The six known species of *Cremnobates* may be thus distinguished:

a. First three spines of dorsal forming a separate fin, the second spine being much higher than any of those in the posterior part of the fin; snout slender, very acute; caudal pale; dorsal with two ocelli, anal with one. MARMORATUS.

aa. First three spines of dorsal scarcely forming a separate fin; none of them higher than the posterior spines; snout not very acute; anal without ocellus.

b. Caudal fin pale, with a dark bar at its base; a notch between third and fourth dorsal spines; dorsal with one ocellus.

c. Dorsal spines about 31.

d. Membrane of third spine joining fourth spine at or slightly above its base.

e. Lateral line, with 34 to 36 scales; dorsal and anal plain dusky.... AFFINIS.

ee. Lateral line, with 38 scales. Pacific coast..... MONOPHTHALMUS.

dd. Membrane of third spine joining fourth spine much above its base. Lat. l. 38. Pacific coast..... INTEGRIPINNIS.

cc. Dorsal spines about 28; membrane of third spine joining fourth above its base; body with distinct dark cross bars..... FASCIATUS.

bb. Caudal fin black; body chiefly black; head mottled with whitish; membrane of third dorsal fin joining fourth near its summit, the fin not notched; dorsal spines 30; dorsal with two ocelli..... NOX.

BATRACHIDÆ.

155. Batrachus tau (L.). *Toadfish.*

Coloration varying very much with the depth and the character of the bottom, the ground color ranging from light gray to brown. No specimens having the coloration of *B. pardus* were noticed. It is abhorred by the fishermen, who consider it very poisonous.

PLEURONECTIDÆ.

156. Platophrys nebularis Jor. & Gilb.

Common in shallow water, in sand.

157. Citharichthys ocellatus (Poey).

A single young specimen taken in a seine with the preceding. The resemblance in color of the two is very great.

158. [Delothyris species?]

Two small flounders, 1½ inches in length, were obtained. These have exactly the technical characters assigned by Mr. Goode to the genus *Delothyris*. It is evident, however, that they are larvæ, and they probably belong to some species of *Platophrys* or *Citharichthys*.

Eyes on the left side: mouth small, without evident teeth; no trace of scales or of lateral line; pectorals on both sides present; ventrals of both sides free from anal: anal rays about 63: form ovate.

Coloration perfectly transparent, jelly-like, with slight greenish shades; five oblique bars running up and backward under dorsal and anal fins, on which they extend; these orange-red in color, and equally distinct on both sides of body.

Specimens of *Platophrys nebularis* as small as these are in the collection. These have the mottled color of the adult. It is probable, therefore, that this *Delothyris* is the larva of some species other than that.

The original *Delothyris pellucidus*, as its describer has suggested, is probably a larva, but its adult form is still probably unknown.

159. Achirus comifer Jor. & Gilb.

Rather scarce; in the sand on shallow bottoms.

160. Achirus inscriptus Gosse.
(*Monochir reticulatus* Poey.)

Common in shallow water on sandy bottom: several specimens taken.

Color in life olivaceous, covered with an irregular net work of blackish lines, these closer together on the head; some specimens crossed by a few vertical streaks, others without traces of these; dorsal and anal colored like the body, rather darker, with a paler edge; caudal abruptly whitish, immaculate: blind side immaculate, darker on the fins: hair-like appendages whitish.

Scales about head enlarged and fringed, especially on eyed side: lip of eyed side much fringed; interorbital width less than eye; upper

eye slightly in advance of lower; right pectoral of three rays, the middle ray somewhat longest; left ventral of one or two very small rays, in some specimens entirely absent; right side with scattered cilia; ventrals five-rayed, the right ventral joined to the anal.

Head, $3\frac{3}{4}$ in length to base of caudal; depth $1\frac{3}{4}$. D. 54; A. 40; Lat. l. 75 to 80.

Our specimens answer Günther's description of *Achirus inscriptus* rather better than Poey's of *Monochir reticulatus*. We think the species identical with both. This species, as well as *A. comifer*, belongs to Dr. Bean's genus *Bæostoma*, but in view of the variations in the development of the pectoral, I regard it rather as a subgeneric section of *Achirus*. The European genus *Monochir* is quite different, having an elongate body, ventrals distinct from the anal, and peculiar scales.

161. Aphoristia plagiusa (L).

A single specimen taken with the seine in the sand.

Extremely pale, almost white in life, each scale with a blackish spot, these forming faint stripes which are narrowest on head. Fins plain, except posteriorly, where the stripes from the body extend slightly on them.

MALTHIDÆ.

162. Malthe radiata (Mitchill).

(*Lophius radiatus* Mitchill, Amer. Monthly Mag., March, 1818, 326. (Straits of Bahama.)
Malthe cubifrons Richardson, 1836.)

This species is rather common in the eel-grass about Key West. As elsewhere stated by us, it appears to intergrade fully with *Malthe vespertilio*, of which species it should be regarded as a variety.

Color in life dull olive-gray, the naked parts above with round black spots; sides and axillary region also with black spots; belly very pale salmon color, darkest on median line; mouth salmon color; Dorsal pale olive, mottled with light gray; ventrals and anal light salmon color; pectorals yellow below mesially, pale at base and tip; above yellowish white, more yellow toward tip and profusely spotted with black; caudal yellowish, its tip blackish, its upper half spotted with black.

BALISTIDÆ

163. Balistes carolinensis Gmelin. *Turbot.*

(*? Balistes capriscus* Gmelin.)

Common; considered a good food-fish, and brought almost daily into the markets.

Color in life olive-gray; a more or less distinct darker cross bar under front of second dorsal and one under last ray; some small violet spots on upper part of back; usually a ring of blue spots, alternating with olive-green streaks, about eye; violaceous marks on sides of snout; first dorsal spotted and clouded with bluish; second dorsal pale yellowish

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with clear sky-blue spots separated by olive-green reticulations, the spots arranged in rows; base of pectoral bluish, with olive spots; anal colored like soft dorsal; pectoral greenish.

164. Monacanthus ciliatus (Mitchill). *Leather-fish.*

Balistes ciliatus Mitchill, Amer. Monthly Mag. and Crit. Rev., March, 1818, 326. (Straits of Bahama.)

Monacanthus occidentalis Günther.

Monacanthus davidsoni Cope).

Extremely common about Key West, swarming in the eel-grass everywhere. No large ones were taken, the longest obtained being about 4 inches in length.

The color varies very much with the surroundings of the fish, from dull olive-gray to the most vivid grass-green. The markings are not well defined and not very constant.

Green, with white cirri on sides; a whitish longitudinal cloud behind pectorals; a pale band downward and forward from eye; lower side of head with darker cross-bands; dorsal and anal pinkish, with (usually three) darker spots at base; ventral flap edged with scarlet; caudal greenish, mottled with darker, and pale.

Some specimens show neither red nor green shades, and have vague dusky longitudinal stripes.

This species is more elongate than *M. hispidus*. Its ventral flap is much larger, although variable in size, and the caudal in the larger specimens is armed with recurved hooks. Small whitish dermal flaps are scattered about on the sides. It is most probable that *Monacanthus davidsoni* Cope is this species, although the coloration is usually less definite than Professor Cope's description would indicate.

165. Monacanthus hispidus (L.). *Leather-fish.*

(*Monacanthus setifer* Auct.)

Young specimens abundant in the eel-grass. A single large one (8 inches long) taken with a spear in deeper water.

It is rather less common than the preceding and passes through very nearly the same series of colors.

Grass-green or olive; back and sides with faint, irregular whitish spots; head plain; spinous dorsal and caudal green; second dorsal and anal translucent; adult less variegated; dull olivaceous, mottled with dusky.

In the adult the first two soft rays of the dorsal are filamentous, their length being a little less than that of the snout. None of the young show these prolongations.

Head, $3\frac{2}{5}$ in length; depth, $1\frac{3}{4}$. D. I, 32; A. 32. The young are slightly deeper ($1\frac{1}{2}$) proportionally than the adult.

OSTRACIIDÆ.

166. Ostracion tricorne L. *Cuckold; Cow-fish.*
(*Ostracion tricornis* and *quadricornis* L.)

Common, the young living in algæ near the shore, the adult in deeper water. Not brought to the markets.

Color light gray, tinged with olive; belly white; head and carapace with round spots of rather light blue, these sometimes forming more or less interrupted longitudinal stripes; about four of these stripes on cheeks; tail above with blue, brown-edged spots; dorsal olive, its base blackish; caudal olive, edged and mottled with light blue: anal similar; pectorals olive.

There seems to be no doubt that the *O. tricornis* and *O. quadricornis* of Linnæus refer to the same species. The former name, occurring earlier in the genus, should have precedence.

167. Ostracion trigonum L. *Shell-fish.*

With the preceding and equally common.

Olive gray; a very faint blue spot in the center of most of the scales; nostril in a yellow spot: boundaries of upper scutes blackish, of lower bluish; outlines of various scutes behind gill-opening black, forming a dusky area; a similar smaller dusky area on sides on level of eye; iris yellow; fins all pale olive; vent yellow; belly light olive, the outlines of the scutes bluish; base of pectorals yellowish.

168. Ostracion triquetrum L. *Rock Shell-fish.*

Scarce; only a few very young specimens taken.

Color in life light olive; covered everywhere above and below with round darker spots of greenish blue, about as large as pupil; fins plain; the caudal peduncle with a few spots.

TETRODONTIDÆ.

169. Chilomycterus geometricus (Bloch).

Moderately abundant; taken with seine in algæ.

170. Diodon hystrix L.

One specimen obtained; brought by a fisherman from the Tortugas.

171. Tetrodon nephelus Goode & Bean. *Swelling-fish.*

Common; young taken with seine in the eel-grass; adult, a foot in length, with hook and line from the fishing smacks.

Adult olive brown, with numerous small light-bluish or greenish spots everywhere, many of them forming ocelli around darker spots of the ground color. Numerous scattered black spots as large as the pupil, one in axil below most distinct; some obscure dark spots along sides of belly, this region being flesh color, with pale rivulations; pectorals yellowish; caudal pale, usually with two dusky shades.

Young specimens are gray and olive above, much mottled with blackish; back with numerous irregular blue spots; iris coppery, the pupil green; belly white, grayish-brown along the sides; twelve round blackish spots along the boundary between sides and belly; a whitish bar at base of caudal; caudal with two bars of blackish olive and one of white; other fins plain; back and sides with whitish cirri.

These young specimens have the back and belly covered with rather large, not close set, stellate prickles as described in the original account of *Tetrodon nephelus*. Of the larger specimens some have prickles only on the back, others on the belly only; one or two only on a small area behind the eyes near the median line, while the majority of the largest are entirely smooth. There is no doubt that these specimens all belong to one species, and that this is the original *Tetrodon nephelus* of Goode & Bean. The loss of the prickles is probably to some extent dependent on age.

Species new to the United States coast.

The following species contained in the present memoir had not been recorded from the coast of the United States at the time the collection was made. Those which were then new to science are printed in italics:

Carcharias lamia Risso.
Narcine umbrosa Jordan.
Stolephorus perfasciatus Poey.
Stolephorus miarchus Jor. & Gilb.
Dussumieria stolifera Jor. & Gilb.
Clupea sardina Poey.
Synodus spixianus Poey.
Cyprinodon riverendi (Poey).
Tylosurus sagitta Jor. & Gilb.
Hemirhamphus unifasciatus Ranzani.
Siphostoma mackayi Swain & Meek.
Siphostoma miurum Swain & Meek.
Siphostoma crinigerum Bean & Dresel.
Mugil trichodon Poey.
Querimana gyrans Jor. & Gilb.
Atherina arœa Jor. & Gilb.
Acanthocybium solandri Cuv. & Val.
Seriola dumerili Risso.
Epinephelus guttatus L.
Lutjanus analis (Cuv. & Val.).
Lutjanus jocú (Bl. &. Schn.).
Lutjanus caxis (Bl. & Schn.).
Hæmulon sciurus (Shaw).
Hæmulon flavolineatum Desmarest.
Hæmulon tæniatum Poey.
Calamus calamus (Cuv. & Val.).

Calamus bajonado (Bl. & Schn.).
Diplodus unimaculatus (Bloch).
Upeneus balteatus Cuv. & Val.
Gerres lefroyi (Goode).
Gerres cinereus (Walbaum).
Pomacanthus aureus (Bloch).
Acanthurus cœruleus (Bloch).
Pomacentrus obscuratus Poey.
Scarus cœruleus (Bloch).
Sparisoma cyanolene Jordan & Swain.
Sparisoma xystrodon Jordan & Swain.
Cryptotomus beryllinus Jordan & Swain.
Xyrichthys rosipes Jor. & Gilb.
Doratonotus thalassinus Jor. & Gilb.
Scorpæna grandicornis Cuv. & Val.
Gobiosoma ceuthœcum Jor & Gilb.
Eleotris smaragdus Cuv. & Val.
Cremnobates fasciatus Steindachner.
Cremnobates affinis Steindachner.
Cremnobates nox Jor. & Gilb.
Platophrys nebularis Jor. & Gilb.
Achirus comifer Jor. & Gilb.
Achirus inscriptus Gosse.
Forty-nine species; seventeen new to science.

LIST OF ADDITIONAL SPECIES GIVEN ON THE AUTHORITY OF FISHERMEN.

In addition to the species collected by myself, I obtained information, apparently unquestionable, of the occurrence of the following species:

Mustelus canis (Mitchill).
Ginglymostoma cirratum (Gmelin). *Nurse Shark.*
Rhinobatus lentiginosus. Garman.
Acipenser sp. *Sturgeon.*
Elacate canada L. *Cavia.*
Nomeus gronovii Gmelin.
Centropomus undecimalis Bloch. *Snooks; Robalo; "Ravallie."*
Epinephelus drummond-hayi Goode & Bean. *Speckled Hind.*
Epinephelus punctatus L. *Nigger-fish.*
Holocentrum ascensione* (Osbeck). *Squirrel-fish.*
Pogonias chromis L. *Drum* (scarce).
Sciæna ocellata L. *Red-fish* (scarce).
Chætodon ocellatus Bloch. *Four-eyed fish.*
Bodianus rufus L. *Spanish Hog-fish.*
In all, fourteen species.

* =*Holocentrum sogo* Auct.; *H. matajuelo* Poey.; *H. longipinne* C. & V.

The following: French Angel, Red-eyed Mullet, Black-fin Snapper (*L. buccanella?*), Glass-eye Snapper (*L. aurorubens?*), Black-a-moor, Rudder-fish, I did not see and am not able certainly to identify. The "Tally-wag" of the fishermen is *Serranus atrarius*, but it is said that it is never taken at the Keys.

SPECIES RECORDED BY OTHER AUTHORS FROM THE FLORIDA KEYS.

The following species not included in the present collection have been recorded from the Florida Keys on what I consider as good authority. Of those marked with the star (*) the writer has examined specimens from the Keys, either in the United States National Museum or in the museum of Yale College:

Rhinobatus lentiginosus Garman. (Egmont.)
Narcine brasiliensis corallina Garman.
Manta birostris (Walb.). (Punta Rossa.)
**Sidera ocellata* (Agassiz). (Egmont Key.)
**Cœcula bascanium* Jordan. (Egmont Key.)
**Cœcula scuticaris* (Goode & Bean). (Egmont.)
**Ophichthys intertinctus* Rich. (Egmont.)
**Myrophis egmontis* Jordan. (Egmont.)
**Opisthonema oglinum* (Le Sueur). (Egmont.)
**Epinephelus apua* (Bloch).
Epinephelus punctatus (L.).
**Hypoplectrus nigricans* (Poey).
**Hypoplectrus gemma* Goode & Bean.
Rhypticus bistrispinosns (Mitch.). (Key West.)
Hæmulon jeniguano Poey. (*Tortugas.*)
**Stromateus alepidotus* (L.). (Egmont.)
Elagatis pinnulatus Poey. (Key West.)
**Nomeus gronovii* Gmelin.
Chætodon capistratus L. (Key West.)
**Chætodon ocellatus* (Bloch.)*
Glyphidodon declivifrons Gill. (Marquesas Keys.)
Xyrichthys psitttacus (L.). (Key West.)
Bodianus rufus (L.).
**Gobiesox virgatulus* Jor. & Gilb. (Egmont.)
**Batrachus pardus* Goode & Bean. (Egmont.)
**Opisthognathus scaphiurus* Goode & Bean. (Tortugas.)
**Gnathypops maxillosus* (Poey). (Tortugas.)
**Blennius asterias* Goode & Bean. (Tortugas.)
**Blennius favosus* Goode & Bean. (Tortugas.)
Fierasfer dubius Putnam. (Key West.)
**Achirus brachialis* (Bean). (Egmont.)
Aulostoma maculatum Val.

* *Chætodon bimaculatus* Bloch, the name *ocellatus* prior.

Monacanthus pullus Ranzani.
**Alutera schœpfi* (Walbaum). (Egmont.)
**Diodon liturosus* Shaw. (Egmont.)
Chilomycterus reticulatus (L.).
**Antennarius ocellatus* (Bloch & Schneider). (Egmont; Key West.)
Antennarius annulatus Gill. (Tortugas.)
Halieutichthys reticulatus (Mitchill). (Key West.)
In all, thirty-nine species.

The total number of species of fishes now known from the Florida Keys is, therefore, about two hundred and twenty. This number will probably be doubled when the species inhabiting deeper waters and those found about the growing reefs are known.

INDIANA UNIVERSITY,
April 14, 1884.

NOTE ON *Calamus proridens*, A NEW SPECIES OF CALAMUS.

By DAVID S. JORDAN and CHARLES H. GILBERT.

In our recent paper on the genus *Calamus* (Proc. U. S. Nat. Mus., 1884, 14–24), we have adopted the name *Calamus pennatula* Guichenot, for the "Little Head Porgy" of the Key West fishermen, supposing that the following clause in Guichenot's description (Revision des Pagels, p. 116) was a slip of the pen or some similar error: "Il a le corps moins haut (than in *C. penna*), plus allongé; sa plus grande hauteur (aux pectorales) náyant pas le tiers de la longueur totale du poisson."

Dr. H. E. Sauvage, of the museum at Paris, informs us that Guichenot's type, taken by Plée at Martinique has a total length of *m.*0.260; depth, *m.* .075; length of head, *m.* .067. Its height is contained therefore nearly $3\frac{1}{2}$ times in the total length and $2\frac{3}{4}$ times in the length to the base of the caudal.

The *Calamus pennatula* is therefore an elongate fish, while the species described by us is an especially short and deep one. We would therefore propose for the species represented by our specimens from Key West and Havana the name *Calamus proridens* Jor. & Gilb. The specific name is intended to refer to the peculiar forward-directed canines of the upper jaw.

A CATALOGUE OF FISHES RECEIVED FROM THE PUBLIC MUSEUM OF THE INSTITUTE OF JAMAICA, WITH DESCRIPTIONS OF *Pristipoma approximans* and *Tylosurus curyops*, TWO NEW SPECIES.

By TARLETON H. BEAN, Curator of the Department of Fishes in the U. S. National Museum, and H. G. DRESEL, Ensign, U. S. Navy.

The Jamaican fishes catalogued below were sent to the U. S. National Museum, for identification, in 1881 and 1882 by the Public Museum of the Institute of Jamaica at Kingston. Two or more examples of each species were included in the collection, in order that one complete set might be returned with the names and the other retained in this museum.

The common names are those in use among the fishermen of Kingston.

We have not thought it necessary to redescribe such of the species as are well described in Günther's Catalogue of Fishes in the British Museum, and simply refer to the descriptions in that work, except in the case of new species.

The numbers under the names of the species refer to the museum catalogue of fishes; those preceded by an * have been retained in this museum; the others were returned to Kingston.

1. **Antennarius tigris** (Poey) Gthr. "SEA TOAD."

Antennarius tigris GÜNTHER, Cat. Fish. Brit. Mus., iii, 1861, p. 189.

*30144. One specimen.

30144. One specimen.

2. **Chilomycterus antennatus** (Cuv.) Kaup. "SOUR-SOP FISH."

Chilomycterus antennatus GÜNTHER, op. cit., viii, 1870, p. 311.

*32040. One specimen.

3. **Diodon liturosus** Shaw. "SOUR-SOP FISH."

Diodon maculatus GÜNTHER, op. cit., viii, 1870, p. 307.

*32050. One specimen.

32050. One specimen.

4. **Tetrodon testudineus** L. "PORPOISE."

Tetrodon testudineus GÜNTHER, op. cit., viii, 1870, p. 282.

30049. One specimen.

*30060. One specimen.

30065. One specimen.

5. **Ostracion quadricorne** L. "COCKLE-FISH."

Ostracion quadricornis GÜNTHER, op. cit., viii, 1870, p. 257.

*30093. One specimen.

30093. One specimen.

*30094. One specimen. The variety mentioned by Günther with brown spots instead of blue.

30094. One specimen.

6. **Ostracion triquetrum** L. "TRUNK-FISH."
Ostracion triqueter GÜNTHER, op. cit., viii, 1870, p. 256.
30097. One specimen.
*30126. One specimen.

7. **Ostracion bicaudale** L. "TRUNK-FISH."
Ostracion bicaudalis GÜNTHER, op. cit., viii, 1870, p. 257.
*30095. One specimen.
30096. One specimen.

8. **Balistes vetula** L. "OLD WENCH"; "OLD WIFE."
Balistes vetula GÜNTHER, op. cit., viii, 1870, p. 215.
30036. One specimen.
30038. One specimen.
*32045. One specimen.
32045. One specimen.

9. **Monacanthus pardalis** Rüpp. "BESSY CORCA."
Monacanthus pardalis GÜNTHER, op. cit., viii, 1870, p. 230.
*30088. One specimen.
30101. One specimen.
*30102. One specimen.

10. **Monacanthus hispidus** L. "TURBOT."
Monacanthus setifer GÜNTHER, op. cit., viii, 1870, p. 239.
30072. One specimen. D. 28; A. 28.
*30072. One specimen. D. 28; A. 28.

11. **Alutera scripta** (Osbeck) Bleeker. "MINGO."
Monacanthus scriptus GÜNTHER, op. cit., viii, 1870, p. 252.
32041. One specimen. D. 47; A. 49.
*32041. One specimen. D. 47; A. 49.

12. **Bæostoma reticulatum** (Poey) Bean. "FLOUNDER."
Solea reticulata GÜNTHER, op. cit., iv, 1862, p. 472.
*30083. One specimen. D. 54; A. 42; scales ca. 75.
30083. One specimen. D. 55; A. 41.

13. **Brotula barbata** (Schn.) Cuv. "BROWNED NOSE OR DEEPWATER COD."
Brotula barbata GÜNTHER, op. cit., iv, 1862, p. 221.
*32054. One specimen.
32054. One specimen.

14. **Dactylopterus volitans** (L.) Gthr. "COOKE."
Dactylopterus volitans GÜNTHER, op. cit., ii, 1860, p. 221.
30063. One specimen.
*30085. One specimen.
30092. One specimen.

15. **Prionotus punctatus** (Bl.) C. & V. "COOKE."
Prionotus punctatus GÜNTHER, op. cit., ii, 1860, p. 193.
*30114. One specimen.
30114. One specimen.

16. **Scorpæna grandicornis** C. & V. "LION-FISH."
Scorpæna grandicornis GÜNTHER, op. cit., ii, 1860, p. 114.
30081. One specimen.
*30087. One specimen.

17. **Scorpæna stearnsii** Goode & Bean. "POISON GROUPER."
Scorpæna stearnsii GOODE & BEAN, Proc. U. S. Nat. Mus., v, p. 421, Sept. 18, 1882.
*32084. Two specimens.
32084. One specimen.

18. **Scorpæna plumierii** Bloch. "LION-FISH."
Scorpæna plumieri GÜNTHER, op. cit., ii, 1860, p. 113.
*30005. One specimen.

19. **Sparisoma catesbyi** (La C.) Bean. "PARROT-FISH."
Scarus catesbyi GÜNTHER, op. cit., iv, 1862, p. 210.
*32060. One specimen.
32060. One specimen.

20. **Sparisoma radians** (Cuv. & Val.) Bean. "GRASSY GROUND PARROT."
Scarus radians GÜNTHER, op. cit., iv, 1862, p. 211.
*32052. One specimen.
32052. One specimen.

21. **Scarus guacamaia** Cuv. & Val. "PARROT-FISH."
Pseudoscarus guacamaia GÜNTHER, op. cit., iv, 1862, p. 233.
29995. One specimen.
*30000. One specimen.
32058. One specimen.
*32058. One specimen.

22. **Lachnolæmus suillus** Cuv. & Val. "BOAR-FISH"; "HOG-FISH"; "PIG-FISH."
Lachnolaimus falcatus GÜNTHER, op. cit., iv, 1862, p. 87.
*32064. One specimen.
32064. One specimen. D. XIV, 11; A. III, 10; scales 8–38–16.

23. **Platyglossus bivittatus** (Bl.) Gthr. "RAINBOW."
Platyglossus bivittatus GÜNTHER, op. cit., iv, 1862, p. 164.
Platyglossus humeralis GÜNTHER, op. cit., iv, 1862, p. 165.
*30125. One specimen.
30129. One specimen.

24. **Gerres plumierii** Cuv. & Val. "STONE BAR."
Gerres plumieri GÜNTHER, op. cit., iv, 1862, p. 253.
*32048. One specimen.
32048. One specimen.

25. Gerres rhombeus Cuv. & Val. "MACCA BACK"; SILVER-FISH."
Gerres rhombeus GÜNTHER (part), op. cit., iv, 1862, p. 253.

30051. One specimen.
*30053. One specimen.
30108. One specimen.
*30108. One specimen.
*30131. Two specimens.
30134. One specimen.

26. Gerres zebra Müll. & Trosch. "SILVER-FISH"; "SHAD."
Gerres aprion (Poey); not *G. aprion* C. & V.
? *Gerres zebra* GÜNTHER, op. cit., 1862, p. 254.

*30117. One specimen.
30128. One specimen.

27. Gerres aprion Cuv. & Val. "SPANISH SHAD."

32065. One specimen. D. IX, 10; A. III, 7; scales 7–43–12.
*32065. One specimen.

28. Gerres harengulus (Goode & Bean) J. & G. "SHAD."
Eucinostomus harengulus GOODE & BEAN, Proc. U. S. Nat. Mus., ii, p. 132, Sept. 19, 1879.

30111. One specimen.
*30121. One specimen.

29. Teuthis hepatus L. "DOCTOR-FISH."
Acanthurus chirurgus GÜNTHER, op. cit., iii, 1861, p. 329.

30037. One specimen. D. IX, 25; A. III, 23.
*30046. One specimen. D. IX, 25; A. III, 23.
30061. One specimen.

30. Teuthis cœruleus (Bl. & Schn.) "DOCTOR-FISH."
Acanthurus cæruleus GÜNTHER, op. cit., iii, 1861, p. 336.

30029. One specimen.
*30033. One specimen.

31. Malacanthus plumierii (Bl.) Cuv. & Val. "SUNSHINE."
Malacanthus plumieri GÜNTHER, op. cit., iii, 1861, p. 359.

*32072. One specimen. D. VI, 56; A. 53.
32072. One specimen.

32. Chætodon ocellatus Bl. "BUTTERFLY."
Chætodon bimaculatus GÜNTHER, op. cit., ii, 1860, p. 9.

*30107. One specimen.
30107. One specimen.
30142. One specimen.

33. Chætodon capistratus L. "BUTTERFLY."
Chætodon capistratus GÜNTHER, op. cit., ii, 1860, p. 12.

*30143. One specimen.
30143. One specimen.

34. **Chætodon striatus** L. "BUTTERFLY."
Chætodon striatus GÜNTHER, op. cit., ii, 1860, p. 8.

*30106. Two specimens.
30106. One specimen.

35. **Holacanthus ciliaris** (L.) Lac. "HORIZONTAL ANGEL-FISH."
Holacanthus ciliaris GÜNTHER, op. cit., ii, 1860, p. 46.

*30023. One specimen.
30028. One specimen.

36. **Holacanthus tricolor** (Bl.) Cuv. & Val. "ROCK BEAUTY."
Holacanthus tricolor GÜNTHER, op. cit., ii, 1860, p. 49.

*30068. One specimen. D. XIV, 18; A. III, 19; scales ca. 50.
30104. One specimen.
*30105. One specimen.

37. **Pomacanthus aureus** (Bl.) Cuv. & Val. "ANGEL-FISH."
Pomacanthus paru GÜNTHER, op. cit., ii, 1860, p. 55.

*32053. One specimen.
32053. One specimen.
*32059. One specimen.
32059. One specimen.

38. **Trichiurus lepturus** Linn. "CUTLASS-FISH."
Trichiurus lepturus GÜNTHER, op. cit., ii, 1860, p. 346.

*30019. One specimen.
30020. One specimen.
30021. One specimen.

39. **Orcynus alliteratus** (Raf.) Jor. & Gilb. "BONEETO."
Thynnus thunnina GÜNTHER, op. cit., ii, 1860, p. 364.

29992. One specimen.
*29993. One specimen.

40. **Vomer setipinnis** (Mitch.) Gill. "BESSY COCKBURN"; "HIGH FOREHEAD"
Argyreiosus setipinnis GÜNTHER, op. cit., ii, 1860, p. 459.

*32043. One specimen.

41. **Selene argentea** La C. "BESSY COCKBURN"; "HIGH FOREHEAD."
Argyreiosus vomer GÜNTHER, op. cit., ii, 1860, p. 458.

*32042. One specimen.

42. **Caranx latus** Agassiz. "HORSE-EYE JACK."
Caranx hippos (part) GÜNTHER, op. cit., ii, 1860, p. 449. (Not *Scomber hippos* L.)

*32069. One specimen (25 inches long). D. VII–I, 20; A. II–I, 17; scutes ca. 30.
32069. One specimen (31 inches long). D. VII–I, 22; A. II–I, 19; scutes ca. 34.

43. **Caranx hippus** (L.) Günther. "COVALLY JACK."
Caranx carangus GÜNTHER, op. cit., ii, 1860, p. 448.

*32080. One specimen. Length, 34 inches.
32080. One specimen. Length, 37 inches. D. VII–I, 21; A. II–I, 17; scutes ca. 35. Breast naked.

44. Caranx bartholomæi Cuv. & Val. "GREEN JACK."
Caranx cibi POEY, Mem. Cuba, ii, 1860, p. 224.
*30089. One specimen. D. VII–I, 27; A. II–I, 24; scutes ca. 30.
30089. One specimen.

45. Chloroscombrus chrysurus (L.) Gill. "WHITING."
Micropteryx chrysurus GÜNTHER, op. cit., ii, 1860, p. 460.
*30042. One specimen.
30043. One specimen.
*30044. One specimen.
30086. One specimen. D. VII–I, 27; A. II–I, 26.

46. Trachynotus rhomboides (Bl.) C. & V. "COBBLER-FISH."
Trachynotus ovatus GÜNTHER, op. cit., ii, 1860, p. 481.
*32061. One specimen.
32061. One specimen. D. VI–I, 20; A. II–I, 18.

47. Oligoplites saurus (Bl. & Schn.) Jord. "SEA POLICEMAN."
Chorinemus occidentalis GÜNTHER, op. cit., ii, 1860, p. 475.
30035. One specimen. D. V–I, 20; A. II–I, 21.
*30039. One specimen.
*30040. One specimen.
30116. One specimen.

48. Stromateus alepidotus (L.) Jor. & Gilb. "PUPPY-FISH."
Stromateus gardenii GÜNTHER, op. cit., ii, 1860, p. 399.
*30064. One specimen.
30066. One specimen. D. 44; A. 40.

49. Upeneus maculatus (Bl.) Cuv.& Val. "GOAT-FISH."
Upeneus maculatus GÜNTHER, op. cit., i, 1859, p. 408.
*30034. One specimen.
30058. One specimen.

50. Holocentrum ascensione (Osbech) Jord. "WELSHMAN."
Holocentrum longipinne GÜNTHER, op. cit., i, 1859, p. 28.
*32049. One specimen.
32049. One specimen.

51. Bairdiella armata Gill. "LONG TEETH."
Bairdiella armata GILL, Proc. Acad. Nat. Sci. Phila., 1863, p. 164.
Corvina armata GÜNTHER, Trans. Zool. Soc. Lond., 1868, p. 428.
*30052. One specimen.

We have compared this West Indian example with the type of *B. armata*, which is said to have come from the west coast of Central America, and fail to find any characters by which the two may be distinguished. So far as we know, the species has not heretofore been recorded from the Atlantic. *Bairdiella argyroleuca*, which, from the published descriptions would seem to be closely similar to *B. armata*, is really very different. The characters by which it may be best distinguished from *armata* are the following: (1) The spines are much more slender; (2) the spinous dorsal is much higher and the second anal spine comparatively very much shorter; (3) the anal origin is farther from the snout; (4) the

vent is much nearer the anal origin; (5) the caudal peduncle is shorter and higher. The proportions of the two forms are well brought out in the table of measurements.

Measurements of species of Bairdiella.

Current number of specimen	35134 *Bairdiella armata* (type).		30052 *Bairdiella armata*.		24696 *Bairdiella argyroleuca*.	
Locality	Panama.		Jamaica, W. I.		Charleston, S. C.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	196	.....	204	.....	205	.....
Length to origin of middle caudle rays	159	.....	167	.....	168	.....
Body:						
Greatest height	52	32.7	54	32.6	55	33
Greatest width	22	13.8	23	14	23	14
Height at ventrals	52	32.7	54	32.6	55	33
Least height of tail	16	10.1	17	10.2	21	12.7
Length of caudal peduncle	20	12.7	21	12.7	19	11.5
Head:						
Greatest length	51	32	53	32	56	33.4
Distance from snout to nape	30	19	.....	.....	.....	.....
Greatest width	24	15½	26	15½	25	15
Width of interorbital area	11	7	11	6.8	11	6.6
Length of snout	11	7	11	6.8	12	7.3
Length of operculum	18	11.4	19	11.5	20	12
Length of maxilla	18	11.4	20	12	20	12
Length of mandible	21	13.3	24	14.4	27	16.2
Length of longest gill-raker	5	3.2	5	3	5	3
Distance from snout to orbit	13	8.2	13	7.8	14	8.4
Diameter of eye	11	7	11	6.8	12½	7.5
Dorsal (spinous):						
Distance from snout	60	38	62	37.5	63	36.8
Length of base	38	24	39	23.5	38	23
Length of longest spine (4th)	26	16.3	27	16.3	33	19.8
Length of first spine	5	3.2	4⅔	3	3	1.8
Length of second spine	13	8.2	13	7.8	14	8.4
Length of last spine (10th)	6	3.8	7	4.2	8	5
Dorsal (soft):						
Length of base	53	33.4	59	35.4	49	29.4
Length of antecedent spine	10	6⅓	8	5	9	5.4
Length of longest ray	23	14.7	24	14.4	26	15.6
Length of last ray	10	6⅓	10	6	10	6
Anal:						
Distance from snout	113	71.5	124	74.4	136	81.5
Length of base	18	11.4	18	11	17	10.2
Length of first spine	8	5	7	4.2	4	2.5
Length of second spine	34	21.5	34	20.5	22	13.2
Length of first ray (longest)	28+	17.5	31	18.6	26	15.6
Length of last ray	11	7	12	7.2	12	7.5
Caudal:						
Length of middle rays	37	23.5	37	22.5	37	22.3
Pectoral:						
Distance from snout	50	31⅝	53	32	54	32.4
Length	33	21	35	21	34	20.4
Ventral:						
Distance from snout	55	34.8	59	35.4	64	38.5
Length of spine	20	12.7	22	13.4	19	11.5
Length of longest ray	35	22.1	35	21	36	22.5
Vent from anal origin	18	11.4	19	11.5	13	7.8
Dorsal	XI, 23	.....	XI, 24	.....	XII, 21	.....
Anal	II, 8	.....	II, 8	.....	II, 9	.....
Pectoral	17	.....	16	.....	16	.....
Ventral	I, 5	.....	I, 5	.....	I, 5	.....
Number of scales in lateral line	50	.....	51	.....	50	.....
Number of transverse rows above lateral line from origin of spinous dorsal	8	.....	8	.....	8	.....
Number of transverse rows below lateral line from anal origin	9	.....	9–10	.....	9	.....
Number of gill-rakers	8+15	.....	8+16	.....	7+15	.....

52. **Micropogon fournierii** (Desm.) Jord. "MONGALAR DRUMMER."

Micropogon undulatus (part) GÜNTHER, op. cit., ii, 1860, p. 271.

*30024. One specimen. D. X–I, 27; A. II, 8; scales 7–52–15.

30054. One specimen.

30069. One specimen.

The chief differences between the West Indian *Micropogon* and *M. undulatus* are in its higher spinous dorsal, its larger scales on the trunk, and in the coloration.

53. **Larimus breviceps** Cuv. & Val. "JEW HARP DRUMMER."

Larimus breviceps GÜNTHER, op. cit., ii, 1860, p. 268.

30026. One specimen.

*30045. One specimen.

54. **Calamus bajonado** (Bl. & Schn.) Poey. "MUCCO PARAGY."

Calamus bajonado POEY, Ann. Lyc. Nat. Hist. N. Y., vol. x, 1872, p. 176, pl. vi, fig. 1.

29994. One specimen.

*29996. One specimen.

55. **Diplodus unimaculatus** (Bloch). "PILOT-FISH"; "BREAM."

Sargus unimaculatus GÜNTHER, op. cit., i, 1859, p. 446.

30090. One specimen.

*30099. One specimen.

30103. One specimen.

30109. One specimen.

30110. One specimen.

*30118. One specimen.

30135. One specimen.

*30136. One specimen.

56. **Hæmulon arcuatum** Cuv. & Val. "YELLOW GRUNT."

*32068. One specimen. D. XII, 16; A. III, 9; scales 6–52–17.

32068. One specimen.

57. **Hæmulon acutum** Poey. "BASTARD MARGARET."

Hæmulon chromis GÜNTHER, op. cit., i, 1859, p. 310.

*32039. One specimen.

32039. One specimen. D. XII, 17; A. III, 8; scales 6–48–13.

58. **Hæmulon parræ** (Desm.) "BLACK GRUNT."

Hæmulon serratum POEY, Mem. Hist. Nat. Cub., ii, 1856–'58, p. 181 (not *Perca chromis* Brouss.).

*32046. One specimen.

32046. One specimen.

59. **Hæmulon gibbosum** (Schn.) Jord. "MARGARET GRUNT."

Hæmulon album GÜNTHER, op. cit., i, 1859, p. 311.

*32051. One specimen. D. XII, 16; A. III, 8; scales 8–51–13.

32051. One specimen. D. XII, 16; A. III, 8; scales 8–51–14.

60. **Hæmulon rimator** Jordan & Swain MSS. "CÆSAR."

Hæmulon chrysopteron C. & V., Hist. Nat. Poiss., v, 1830, p. 240; GÜNTHER, op. cit., i, 1859, p. 313; HOLBROOK, Ichth. S. C., 1860, p. 121, pl. xvii, fig. 1.

*30070. One specimen.

30076. One specimen.

30120. One specimen.

*30137. One specimen.

61. **Hæmulon fremebundum** Goode & Bean. "Bow Grunt."

Hæmulon fremebundum Goode & Bean, Proc. U. S. Nat. Mus., ii, p. 340, Mar. 25, 1880.

30022. One specimen.

*30057. One specimen.

We have examined adult specimens from Key West and Jamaica, and find that *fremebundum* is quite different from *chromis* and *rimator* as well as all other *Hæmulons* known to us.

Measurements.

Hæmulon fremebundum Goode & Bean.

Current number of specimen	30022		30057	
Locality	Jamaica.		Jamaica.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Length to origin of middle caudal rays	264	.....	225	.....
Body:				
Greatest height	103	39	85	37.7
Greatest width	44	16⅔	34	15
Height at ventrals	103	39	85	37.7
Least height of tail	25	9.5	23	10
Length of caudal peduncle	42	15.9	36	16
Head:				
Greatest length	100	38	85	37.7
Length of longest gill-raker	5	1.9	4⅓	.....
Greatest width	44	16⅔	36	16
Width of interorbital area	27	10.3	22	9.7
Length of snout	35	13.3	32	14
Length of operculum	26	10	20	9
Length of maxillary	41	15.5	37	16
Length of upper jaw	49	18.6	44	19.5
Length of mandible	51	19.3	45	20
Distance from snout to orbit	39	14.8	36	16
Diameter of orbit	23	8.8	20	9
Dorsal (spinous):				
Distance from snout	111	42	98	43.5
Length of base	80	30⅓	71	31.5
Length of first spine	11+	4⅙	12	5
Length of longest spine	40	15.2	34	15
Length of eleventh spine	16	6	16	7
Dorsal (soft):				
Length of base	52	20	45	20
Length of antecedent spine	17	6.6	17	7½
Length of first ray	28	10.5	26	11.5
Length of longest ray	32	12	30	13
Length of last ray	16	6	17	7.5
Anal:				
Distance from snout	190	72	167	74
Length of base	31	11.7	27	12
Length of first spine	7	2.6	7	3
Length of second spine	34	13.2	30	13
Length of third spine	32	12	26	11.5
Length of first ray	38	14	35	15.6
Length of longest ray	38	14	35	15.6
Length of last ray	18	7	18	8
Caudal:				
Length of middle rays	24	9	24	10.7
Length of external rays	61	23.1	56	25
Pectoral:				
Distance from snout	95	37	86	38
Length	76	29	66	29.3
Ventral:				
Distance from snout	108	41	91	40.5
Length	56	21	52	23
Dorsal	XI–I, 16	.....	XI–I, 16	.....
Anal	III, 9	.....	III, 9	.....
Number of scales in lateral line	50	.....	50	.....
Number of transverse rows above lateral line	8	.....	8	.....
Number of transverse rows below lateral line	13	.....	13	.....
Number of gill-rakers	11/17	.....	11/17	.....

62. **Pomadasys approximans**, n. sp.

*30062. One specimen.

30084. One specimen.

This species very closely resembles *P. cultriferum* of Poey, as described in Memorias, ii, p. 185. It agrees with the description in everything except the comparative lengths of the dorsal and anal spines. One of Professor Poey's own specimens determined by him as *P. cultriferum*, No. 4699 in the National Museum collection, agrees even less with his description of the species in the Memorias than do the two specimens under consideration. We have determined, provisionally, to give it the name *P. approximans*, and present a full description and table of measurements.

The body is robust and comparatively high. The profile descends obliquely in an almost straight line from the origin of the spinous dorsal to above the eye, the profile of the snout being steeper. The eye is large, slightly longer than the snout. The interorbital space is flat, its width measured on the bone being about two-thirds of the length of the eye. The maxilla, concealed entirely by the preorbital, reaches to the vertical through the anterior margin of the eye. The height of the preorbital, measured at the middle of the length of the upper jaw, is equal to the interorbital width. The edge of the preopercle is slightly notched and strongly serrated; the serrations of the angle are longer and wider apart than those on the vertical limb. The lower limb is smooth. The teeth are in villiform bands in both jaws, with the outer rows scarcely enlarged. The vomer, palatines, and tongue are toothless. Gill-rakers short, smooth, and widely set, 5 above and 11 below the angle of the anterior arch. The head is scaled throughout, except on the muzzle. The scales of the opercle are irregular in size, and in about seven rows. The bases of the pectorals, ventrals, and caudal fin are scaly. The vertical fins are scaleless, the bases of the soft dorsal and anal being provided with low scaly sheaths. The dorsal spines are very strong, and alternately wider on one side than on the other, permitting the depression of the fin.

The height of the body is contained $2\frac{3}{4}$ times in the length to the caudal base, and the length of the head 3 times in the same. The diameter of the eye, which equals the least height of the tail, is contained $3\frac{1}{2}$ times in the length of the head. The caudal peduncle is as long as the postorbital part of the head. The first dorsal spine is one-half the length of the second, which is as long as the eye. The fourth dorsal spine is the longest, and is equal to one-half the greatest height of the body. Thence the lengths of the spines gradually decrease to the twelfth and thirteenth spines, which are equal in length, and as long as the second spine. The length of the base of the spinous dorsal is about equal to the distance of its origin from the snout. The length of the base of the soft dorsal is equal to that of the longest dorsal spine. The longest dorsal ray is equal in length to the ninth spine, and is contained about

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2⅓ times in the length of the head. The length of the second anal spine is slightly more than twice the diameter of the eye, and about 3 times the length of the first anal spine. The third anal spine is about two-thirds of the length of the second, and is contained 2½ times in the length of the head.

The length of the pectoral fin is about twice that of the postorbital part of the head, and equals the height of the body at the vent. The ventral is two-thirds as long as the head.

Color, in spirits, olive-gray, with brownish shades. The opercular flap is brown. The membrane of the spinous dorsal is edged with black. The soft dorsal and anal are faintly spotted with brown, the bases of the fins being light. The tips of the ventrals and of the middle caudal rays are dusky.

B. VII; D. XIII, 12; A. III, 7; scales 8–50–15.

A table of measurements follows:

Measurements.

POMADASYS APPROXIMANS.

Current number of specimen	30084		30062	
Locality	Jamaica.		Jamaica.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Length to origin of middle caudal rays	188	.....	180	.....
Body:				
Greatest height	68	36	65	36
Greatest width	29	15.4	28	15.5
Height at ventrals	68	36	65	36
Least height of tail	19	10	18	10
Length of caudal peduncle	26	14	26	14.4
Head:				
Greatest length	65	34.5	61	34
Distance from snout to nape	48	25.5	46	25
Greatest width	30	16	29	16
Width of interorbital area	13	7	12	7
Length of snout	18	9.5	16	9
Length of operculum with flap	21	11	19	10.6
Length of maxillary	18	9.5	17	9.4
Length of mandible	24	13	23	12.5
Distance from snout to orbit	20	10.6	20	11
Diameter of orbit	19	10	18½	10
Dorsal (spinous):				
Distance from snout	74	40	72	40
Length of base	74	40	70	39
Length of longest spine (fourth)	34	18	33	18.4
Length of first spine	10	5	9	5
Length of second spine	20	10.6	17	9.4
Length of last spine	19	10	17	9.4
Dorsal (soft):				
Length of base	33	17.5	32	18
Length of antecedent spine	19	10	17	9.4
Length of first ray	27	14	25	14
Length of longest ray	28	15	26	14.4
Length of last ray	15	8	13	7
Anal:				
Distance from snout	136	72.3	132	73
Length of base	26	14	25	14
Length of first spine	13	7	12½	7
Length of second spine	39	20.7	38	21
Length of third spine	26	14	26	14.4
Length of first ray	28	15	27	15
Length of longest ray	28	15	27	15
Length of last ray	13	7	14	7.8

Measurements—Continued.

	Millimeters.	100ths of length.	Millimeters.	100ths of lengths.
Caudal:				
Length of middle rays	36	19	32	18
Length of external rays, upper lobe	41	21.8	40	22
Length of external rays, lower lobe	37	19.7	36	20
Pectoral:				
Distance from snout	68	36	62	34
Length	59	31	54	30
Ventral:				
Distance from snout	75	40	68	37.8
Length to end of longest ray	48	25.5	43	24
Branchiostegals	VII	.....	VII	.....
Dorsal	XIII, 12	.....	XIII, 12	.....
Anal	III, 7	.....	III, 7	.....
Ventral	I, 5	.....	I, 5	.....
Number of scales in lateral line	50	.....	50	.....
Number of transverse rows above lateral line	8	.....	8	.....
Number of transverse rows below lateral line	15	.....	15	.....
Number of gill-rakers	$\frac{5}{11}$	.....	$\frac{5}{11}$	.....

63. Anisotremus virginicus (L.) Gill. "GOVERNOR BREAM."

Pristipoma virginicum GÜNTHER, op. cit., i, 1859, p. 288.

*32081. One specimen.

32081. One specimen.

64. Conodon nobilis (L.). "COIL DRUMMER."

Conodon plumieri GÜNTHER, op. cit., i, 1859, p. 304.

*32047. One specimen.

32047. One specimen.

65. Lutjanus jocu Poey. "SCHOOL-MASTER SNAPPER"; "BLACK SNAPPER"; "BUTT SNAPPER"; "DOGTEETH SNAPPER."

*30007. One specimen.

30027. One specimen. D. X, 14; A. III, 8; scales 8–45–16.

30041. One specimen.

30079. One specimen.

*32062. One specimen. D. X, 14; A. III, 8; scales 8–46–16.

66. Lutjanus buccanella (C. & V.). "BUTT SNAPPER."

Mesoprion buccanella GÜNTHER, op. cit., i, 1859, p. 198.

32063. One specimen. D. XI, 13; A. III, 8; scales 7–52–17.

67. Lutjanus analis Poey. "PAT SNAPPER"; "ROUNDER SNAPPER"; "RED SNAPPER"; "MUTTON SNAPPER."

Mesoprion uninotatus GÜNTHER, op. cit., i, 1859, p. 202.

30031. One specimen.

*30047. One specimen.

*30048. One specimen.

30050. One specimen.

30082. One specimen.

30112. One specimen.

*30122. One specimen.

30132. One specimen.

68. Lutjanus stearnsii Goode & Bean. "BLACK SNAPPER."

Lutjanus stearnsii GOODE & BEAN, Proc. U. S. Nat. Mus., i, p. 179, Oct. 4, 1878.

*32056. One specimen.

32057. One specimen.

30010. One specimen.

*30123. One specimen.

69. Ocyurus chrysurus (Bl.). "YELLOW TAIL."

Mesoprion chrysurus GÜNTHER, op. cit., i, 1859, p. 186.

*30008. One specimen.

30025. One specimen.

32085. One specimen.

70. Rhypticus arenatus C. & V. "SOAP FISH."

Rhypticus arenatus GÜNTHER, op. cit., i, 1859, p. 173.

*30130. Two specimens.

30130. Two specimens.

71. Tropidinius dentatus (Guich). "SILK."

Mesoprion dentatus GÜNTHER, op. cit., i, 1859, p. 188.

32055. One specimen. B. VII; D. X, 10; A. III, 8; scales 9–65–19.

*32075. One specimen. B. VII; D. X, 10; A. III, 8; scales 9–64–19.

Measurements.

APRION DENTATUS.

Current number of specimen Locality	32075 Kingston, Jamaica.		32055 Kingston, Jamaica.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Length to origin of middle caudal rays	295	.....	385	.....
Body:				
Greatest height	119	40.5	152	39.5
Greatest width	41	14	60	15.7
Height at ventrals	119	40.5	149	39
Least height of tail	34	11.6	45	12
Length of caudal peduncle	63	21.5	79	20.5
Head:				
Greatest length	96	33.8	118	30.5
Distance from snout to nape	56	19	84	22
Greatest width	42	14.3	59	15
Width of interorbital area	26	9	39	10
Length of snout	31	10.6	39	10
Length of operculum	27	9.4	35	9
Length of longest gill-raker	13	4.5	15	4
Length of maxillary	31	10.6	41	10.5
Length of mandible	47	16.2	57	14.6
Distance from snout to orbit	32	11	46	12
Diameter of eye	22	7.5	26	6.8
Dorsal (spinous):				
Distance from snout	115	39.2	151	39
Length of base	81	27.5	102	26.5
Length of longest spine:				
Fourth	.....	.....	52	13.6
Fifth	41	14	.....	.....
Length of first spine	16	5.5	22	5.7
Length of second spine	29	10	40	10.4
Length of last spine	27	9.4	38	10
Dorsal (soft):				
Length of base	61	21	83	21.6
Length of first ray	31	10.6	43	11.3
Length of longest ray	40	13.8	52	13.6
Length of last ray	38	13	46	12

Measurements—Continued.

	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Anal:				
Distance from snout	187	63.6	247	64
Length of base	53	18	68	17.6
Length of first spine	10	3.5	16	4
Length of second spine	19	6.5	27	7
Length of third spine	26	9	34	8.8
Length of first ray	35	12	46	12
Length of longest ray	37	12.8	55	14.4
Length of last ray	35	12	49	12.8
Caudal:				
Length of middle rays	41	14	50	13
Length of external rays	89	30.3	100	26
Pectoral:				
Distance from snout	90	30.7	115	30
Length	102	35	130	33.7
Ventral:				
Distance from snout	112	38	141	36.6
Length	71	24.2	97	25
Branchiostegals	VII		VII	
Dorsal	X, 10		X, 10	
Anal	III, 8		III, 8	
Pectoral	II, 14		II, 14	
Ventral	I, 5		I, 5	
Number of scales in lateral line	64		65	
Number of transverse rows above lateral line	9		9	
Number of transverse rows below lateral line	19		19	
Number of gill-rakers	$\frac{7}{15}$		$\frac{7}{16-17}$	

72. Epinephelus apua (Bl.) "ROCK HIND."

Serranus apua GÜNTHER, op. cit., i, 1859, p. 140.

*30006. One specimen.

30009. One specimen.

73. Enneacentrus punctatus (L.) Poey. "BUTTER-FISH."

Serranus ouatalibi GÜNTHER, op. cit., i, 1859, p. 120.

*32083. One specimen.

32083. One specimen.

74. Epinephelus striatus (Bloch) Gill. "ROCK COD"; "GROUPER."

Serranus striatus GÜNTHER, op. cit., i, 1859, p. 110.

29990. One specimen.

*32044. One specimen.

32044. One specimen.

75. Trisotropis bonací Poey. "ROCK COD."

Trisotropis aguají POEY, Rep. Fis. Nat. Cuba, ii, 1866–'68, p. 229.

*29991. One specimen. Length, 20½ inches.

A specimen of *Trisotropis* in this collection resembles *T. brunneus* of Poey, but it is apparently *T. bonací* of the same author, and we refer it provisionally to that species. It is not *T. undulosus* C. & V., of which Dr. Bean has examined a specimen in the Paris museum. Whether or not we are right in using the name *bonací* remains to be determined, and in order to aid in settling the question we append a full description of the example.

In shape the species resembles *T. stomias* Goode & Bean, but its scales are much larger than in *stomias*. The greatest height of the body

is contained $3\frac{1}{5}$ times in its length to the origin of the middle caudal rays, and equals twice the length of the maxilla. The least height of the tail equals the length of the caudal peduncle, and is contained $2\frac{1}{3}$ times in the greatest body height. The length of the head equals twice the length of the anal base, and is contained $2\frac{3}{5}$ times in the standard length, which is the total length to caudal base. The lower jaw projects beyond the upper a distance equal to one-fourth the length of the snout. The length of the snout is nearly one-fourth that of the head, and is about twice the length of the eye, which is contained $7\frac{1}{2}$ times in the length of the head measured to the tip of the opercular flap. The maxilla extends behind the vertical through the posterior margin of the eye and is two-fifths of the length of the head. The distance of the eye from the upper profile of the head is less than one-half the vertical diameter of the eye. The preopercle has a very indistinct notch behind; the denticulations are almost obsolete except at the angle, where there are a few small ones. The lower jaw has two rows of teeth, the outer row of strong, fixed, curved teeth; the inner row of longer, more widely separated, depressible teeth; two canine-like teeth near the symphysis. The outer row in the upper jaw is similar to that in the lower jaw; behind it is a band of closely-placed, smaller, villiform teeth; on each side of the symphysis is a patch of depressible teeth, and in advance of these patches are two moderate canines on the left side and one on the right side. The vomerine and palatine teeth are in villiform bands. The maxilla is scaled on its upper portion. There are also rudimentary scales at the mandibular symphysis. The gill-rakers are strong, with their inner margins spinous. There are three developed gill-rakers above and nine below the angle of the anterior arch, besides a few rudimentary ones both above and below. The longest gill-raker is about two-thirds of the longest diameter of the eye.

The distance of the dorsal origin from the snout is equal to that of the ventral origin from the snout. The length of the base of the spinous portion is equal to that of the soft portion. The first dorsal spine is one-half the length of the third spine; the fourth spine is the longest, and equal to one-third the length of the head without the opercular flap.

The distance of the anal fin from the snout is equal to twice the greatest height of the body. The length of the anal base is about one-half the length of the head, and slightly greater than the length of the pectoral. The first anal spine is one-half as long as the eye and two-fifths of the length of the second spine, which is not quite two-thirds as long as the third. The length of the third spine is about one-half that of the ventral.

The length of the pectoral is one-half the length of the head to the end of the opercular spine. The distance of the ventral from the snout is twice the length of the pectoral, and the length of the ventral is equal to the length of the head without the postorbital portion; it is also equal to that of the upper jaw. The vent is midway between the tip of the

extended ventral and the anal origin. The length of the middle caudal ray measured from its anatomical origin is one-half the length of the head. The caudal fin is nearly truncate when expanded, with the tips very slightly produced. Scales about 100 to the anatomical origin of the middle caudal rays. Between the lateral line and the origin of the spinous dorsal fin there are about 16 or 17 scales, and about 30 below.

Radial formula: D. XI,17; A. III,12; V. I,5; gill-rakers, 3+9; scales, 16–100–30.

The general color is violet-brown, with obscure bluish-white blotches on the head and the body. A large dark blotch about twice as large as the eye under the middle of the spinous dorsal. The margins of the soft dorsal, anal, and caudal are dark; the middle of the soft dorsal, anal, and caudal obscurely yellowish. The pectoral is dark in its anterior third, elsewhere yellowish. Ventrals dark.

In coloration this species resembles greatly Bermudan specimens of *Trisotropis undulosus* in the British Museum, but that species has a large number (ca. 34) of gill-rakers.

Measurements.

TRISOTROPIS BONACI POEY.

Current number of specimen	29991.
Locality	Jamaica, W. I.
	Millimeters.	100ths of length.
Length to origin of middle caudal rays	435	.....
Body:		
Greatest height	137	31½
Greatest width	54	12⅜
Height at ventrals	130	30
Least height of tail	50	11½
Length of caudal peduncle	50	11½
Head:		
Greatest length to end of opercular flap	168	38.6
Longest gill-raker	16	3.7
Greatest width	65	15
Width of interorbital area	30	7
Length of snout	36	8.3
Length of operculum to end of flap	65	15
Length of maxillary	68	15.6
Length of mandible	87	20
Distance from snout to orbit	44	10.2
Diameter of orbit	21	5
Dorsal (spinous):		
Distance from snout	162	37.2
Length of base	116	26⅝
Longest spine (fourth)	53	12.2
Length of first spine	22	5.1
Length of second spine	41	9.5
Length of last spine (tenth)	46	10.6
Dorsal (soft):		
Length of base	118	27.2
Length of antecedent spine	40	9.2
Length of first ray	51	11.7
Length of longest ray	55	12.6
Length of last ray	32	7.4
Anal:		
Distance from snout	280	64.4
Length of base	85	19.5
Length of first spine	11	2.6
Length of second spine	25	5.7
Length of third spine	36	8.3
Length of first ray	56	12.9
Length of longest ray	61	14
Length of last ray	33	7.7

Measurements—Continued.

	Millimeters.	100ths of length.
Caudal:		
Length of middle rays	86	20
Length of external rays	94	21.6
Pectoral:		
Distance from snout	147	33.8
Length	80	18.4
Ventral:		
Distance from snout	164	37.7
Length	74	17
Dorsal	XI, 17	.....
Anal	III, 12	.....
Gill-rakers	3 + 9	.....
Number of scales in lateral line	ca 100	.....
Number of transverse rows above lateral line	16	.....
Number of transverse rows below lateral line	30	.....

76. Centropomus undecimalis (Bl.) C. & V. "SNOOK."

Centropomus undecimalis GÜNTHER, op. cit., i, 1859, p. 79.

30004. One specimen.

*30011. One specimen.

77. Chætodipterus faber (Broussonet) Jor. & Gilb. "PORTUGUESE."

Ephippus faber GÜNTHER, op. cit., ii, 1860, p. 61.

30074. One specimen. D. VIII–I, 23; A. III, 17.

*30141. One specimen.

78. Elacate canada (L.) Gill. "SHARK-WAITING-BOY."

Elacate nigra GÜNTHER, op. cit., ii, 1860, p. 375.

32078. One specimen.

*32078. One specimen. D. VIII, 29; A. 27.

79. Sphyræna guaguanche C. & V. "SNIT."

Sphyræna guachancho C. & V., Hist. Nat. Poiss., iii, 1829, p. 342.

*30015. One specimen.

30016. One specimen.

80. Sphyræna picuda Bl. & Sch. "BARRACOUTA."

Sphyræna picuda GÜNTHER, op. cit., ii, 1860, p. 336.

32079. One specimen (35 inches long). D. V–I, 9; A. I, 9; scales 10–81–13.

*32079. One specimen.

81. Echeneis naucrates L. "SUCKING-FISH."

Echeneis naucrates GÜNTHER, op. cit., ii, 1860, p. 384.

30002. One specimen.

*30003. One specimen.

82. Mugil curéma C. & V. "MULLET."

Mugil brasiliensis GÜNTHER, op. cit., iii, 1861, p. 431.

*30032. One specimen.

30056. One specimen.

*30078. One specimen.

30091. One specimen.

83. Tylosurus notatus (Poey) Jor. & Gilb. "LONG-JAW."

Belone notata GÜNTHER, op. cit., vi, 1866, p. 248.

32074. One specimen. D. 13; A. 12.

84. Tylosurus euryops, n. sp. "LONG-JAW."

*32073. One specimen. D. i, 15; A. i, 17; V. I, 5.

This collection contains one specimen of a species of *Tylosurus* which appears to be undescribed, and for which, on account of its large eye, we propose the name *T. euryops*.

As the result of an injury the mandible is imperfect and shorter than the upper jaw. The species is quite similar in general appearance to *T. depressus* (Poey); but the eye is much larger than in that species. It resembles, also, *T. truncatus* (Poey), but the caudal peduncle is deeper than wide.

The head to the end of the upper jaw forms one-third of the total length to the end of the caudal fin. The length of the eye is contained $5\frac{1}{2}$ times in that of the snout, and twice in that of the post-orbital part of the head: it is also equal to the width of the interorbital space. The depth of the head exceeds its width, and is contained about $5\frac{1}{2}$ times in its length. The length of the pectoral is contained 6 times in the distance from the tip of the upper jaw to the origin of the ventral, which is about midway between the nostril cavity and the origin of the middle caudal rays. The length of the ventral is one-half that of the pectoral. The length of the dorsal base equals that of the head without the upper jaw. The longest dorsal ray is about one-half the length of the anal base. The longest anal ray is as long as the post-orbital part of the head. The origin of the dorsal fin is 4 times as far from the extremity of the upper jaw as it is from the origin of the middle caudal rays (at the end of the scales). The origin of the anal fin is slightly in advance of that of the dorsal fin. The lower caudal lobe is somewhat longer than the upper; its length slightly exceeds that of the pectoral fin. The upper caudal lobe is twice as long as the eye.

85. Tylosurus gladius Bean. "GUARD-FISH."

Tylosurus gladius BEAN, Proc. U. S. Nat. Mus. v, p. 430, Sept. 18, 1882.

*32077. One specimen. D. 23; A. 21.

32077. One specimen.

86. Hemirhamphus balao Le Sueur. "PIPER."

Hemirhamphus brasiliensis GÜNTHER, op. cit., vi, 1866, p. 270.

30055. One specimen.

*30077. One specimen.

*30100. One specimen.

30115. One specimen.

87. Synodus fœtens (L.) Gill. "MUCCO ROBIN."

Saurus fœtens GÜNTHER, op. cit., v, 1864, p. 396.

*32076. One specimen. D. 12; A. 11; scales 7–63–8.

32076. One specimen. D. 11; A. 11; scales 6–62–7.

32076. One specimen. D. 11; A. 11; scales 6–62–7.

88. **Elops saurus** L. "JOHN MARIGGLE"; "BONY-FISH."
Elops saurus GÜNTHER, op. cit., vii, 1868, p. 470.

32070. One specimen (30 inches). D. 24; A. 14; scales 13–115–17.

*32070. One specimen (24 inches).

89. **Stolephorus productus** (Poey). "GRUBBER BROAD-HEAD."
Engraulis productus GÜNTHER, op. cit., vii, 1868, p. 388.

*30113. Two specimens.

30113. One specimen.

*30138. One specimen. D. 13; A. 30; l. lat. 40.

90. **Opisthonema oglina** (Le Sueur) Goode & Bean. "SPRAT."
Clupea thrissa GÜNTHER, op. cit., vii, 1868, p. 432.

30098. One specimen.

*30124. One specimen.

30124. One specimen.

30133. One specimen.

91. **Clupea pseudohispanica** (Poey) Gthr. "BANG."
Clupea pseudohispanica GÜNTHER, op. cit., vii, 1868, p. 442.

30067. One specimen.

*30071. One specimen.

30140. One specimen.

*30140. One specimen.

92. **Clupea humeralis** (C. & V.) Gthr. "WHITE-BILL"; "PINCERS."
Clupea humeralis GÜNTHER, op. cit., vii, 1868, p. 422.

30080. One specimen.

30139. Two specimens.

93. **Cetengraulis edentulus** (Cuv.) Gthr. "TRAPONG FRY."
Cetengraulis edentulus GÜNTHER, op. cit., vii, 1868, p. 383.

30073. One specimen.

*30075. One specimen.

*30119. One specimen.

*30127. Two specimens.

30127. Two specimens.

94. **Conger niger** (Risso) Jor. & Gilb. "DEEP-WATER EEL."
Conger vulgaris GÜNTHER, op. cit., viii, 1870, p. 38.

*32071. One specimen (39½ inches long).

32071. One specimen (42½ inches long).

95. **Sidera funebris** (Ranz.) Jor. "CONGER EEL."
Muræna afra GÜNTHER, op. cit., viii, 1870, p. 123.

32067. One specimen (5 feet long).

*32067. One specimen (41 inches long).

96. **Sidera moringa** (Cuv.) Jor. "MURRAY EEL."
Muræna moringa GÜNTHER, op. cit., viii, 1870, p. 120.

*32066. One specimen.

32066. One specimen.

97. **Narcine brasiliensis** (Olfers) Henle. "TREMBLER."
Narcine brasiliensis GÜNTHER, op. cit., viii, 1870, p. 453.

*32082. One specimen. ♂.
32082. One specimen ♀ (much darker in color than the ♂).

98. **Rhinobatus undulatus** Olfers. "SEA FIDDLER."
Rhinobatus undulatus GÜNTHER, op. cit., viii, 1860, p. 444.

*30001, ♂. One specimen.
30017, ♂. One specimen.
*30018, ♀. One specimen.

99. **Sphyrna zygæna** (L.) Müll. & Henle. "SHOVEL-NOSE SHARK."
Zygæna malleus GÜNTHER, op. cit., viii, 1870, p. 381.

29998, ♀. One specimen.
*29999, ♂. One specimen.

100. **Carcharias terræ-novæ** (Rich.) Gthr. "GROUND SHARK"; "TIGER SHARK"; "WHITE SHARK."
Carcharias terræ-novæ GÜNTHER, op. cit., viii, 1870, p. 360.

29997. One specimen. ♂.
30012. One specimen. ♂.
30013. One specimen. ♀.
*30014. One specimen. ♂.
*30059. One specimen.
30059. One specimen.

ON A NEW MUSKRAT, *Neofiber Alleni*, FROM FLORIDA.

By FREDERICK W. TRUE, M. S.,

Curator of the Department of Mammals in the U. S. National Museum.

WASHINGTON, *June* 30, 1884.

In December, 1883, the Museum received from Mr. William Wittfeld, of Georgiana, Brevard County, Florida, a small rodent which was immediately recognized as differing from any species which had been hitherto described. I gave a brief account of it in Science for ———, 1884, which I wish now to supplement by a somewhat fuller and more technical description.

New genus, NEOFIBER.

Skull and dentition as in *Fiber*. Feet normal; toes not bent laterally at an angle with the sole; tail, round.

New species, NEOFIBER ALLENI.

Neofiber Alleni, True, Science, IV, No. 75, 1884, p. 34.

A muskrat of less than half the size of *Fiber zibethicus*, but of the same general form. Eyes small and high up on the head. Ears mod-

erate, broad and rounded, hirsute within the conch, the longest hairs extending 0.8 centimeter beyond the margin. Border of the conch slightly and unevenly notched. Fore feet as in *F. zibethicus*. Palm black, except the two large posterior tubercles and the base of the thumb. Hind feet moderate, not equaling twice the length of the fore-feet. Soles naked, smooth, black, and 5-tuberculate.*

The posterior-internal tubercle large and oval in outline. The remaining four situated respectively at the angle between the 1st and 2d toes between the 2d and 3d, between the 3d and 4th, and between the 4th and 5th; all small and of equal size. Soles narrow. Toes not inclined laterally at an angle with the sole. Fringe of the toes and sole not extending prominently below the plane of their lower surface.

Toes of the fore and hind feet only slightly webbed. Claws horn-colored. Tail round, about 0.6 centimeter at the base and tapering gradually to the tip. Sparsely clothed with short blackish hairs, between which the tail appears covered with rows of scales as in *Mus*.

Color of the hair of the body above as in *F. zibethicus;* rich rufous at the upper two-fifths and lead-color at the base. In a small area just behind the shoulders the base of the hairs is white. Color of the head the same as of the body, but darker. Hair of the under surface of the body light rufous at the upper third, lead-color at the base. Chin, throat, and inner side of the fore arms and legs white or but faintly tinged with rufous. Fore and hind feet above clothed with short, dull-brown hairs which extend to the tips of the toes.

The skull, so far as examined, does not differ from that of *F. zibethicus* except in proportions.

The species is named in honor of my friend Prof. J. A. Allen, whose well known monographs of North American mammals place him in the front rank of American zoologists.

Measurements of Neofiber Alleni, from the typical alcoholic specimen from Georgiana, Florida.

	Centimeters.
Length of head and body	20.2
Length of head	5.2
Length of tail	12.6
Length of hind foot (without claws)	3.9
Length of fore foot (without claws)	2.3
Nose to eye	2.0
Nose to base of ear	4.5
Height of ear	1.8
Length of middle toe of fore foot (without claw)	.9
Length of middle toe of hind foot (without claw)	1.0
Longest claw of fore foot	.5
Longest claw of hind foot	.6

*The hind feet of *F. zibethicus* are in reality 5-tuberculate although generally described as *quadri-tuberculate.*

Measurements of the skull.

	Centimeters.
Total length	4.7
Greatest width	2.9
Length of nasals	1.2
Length of tooth-row	1.1
Front edge of first molar to posterior margin of incisors	1.6
Greatest width of muzzle	.7
Width of interorbital bridge	.5
Center of occipital crest to line of hinder margin of orbits	1.9

It is evident from an examination of *Neofiber* that the genus stands intermediate between the aberrant *Fiber* and the normal arvicoline genera. The skull, the large head, and peculiar ears, and the heavy form show its affinity to *Fiber*, while the feet and tail prove its close relationship to the other arvicolas.

It will be interesting to know how far the habits of this animal resemble those of the ordinary muskrat.

ON A COLLECTION OF BIRDS MADE BY MESSRS. J. E. BENEDICT AND W. NYE, OF THE UNITED STATES FISH COMMISSION STEAMER "ALBATROSS."

By ROBERT RIDGWAY.

A collection of birds made by Messrs. J. E. Benedict and W. Nye, naturalists accompanying the steamer "Albatross" on her winter's cruise through West Indian waters and along the southern coast of the Caribbean Sea, although not extensive, is of much interest. This is especially true of those collected on the island of Old Providence, 250 miles north of Aspinwall, all the species from that locality being new to science.

The species collected at the different stations are given under separate headings:

I.—ISLAND OF ST. THOMAS, WEST INDIES (January 17–24, 1884).

1. **Mimus gilvus**, Vieill. One specimen.
2. **Dendroica petechia** (Linn.). One specimen.
3. **Certhiola portoricenses**, Bryant. Six specimens.
4. **Phonipara zena** (Linn.). Eleven specimens.
5. **Icterus vulgaris**, Daud. One specimen.
6. **Tyrannus dominicensis** (Gm.). Seven specimens.
7. **Crotophaga ani**, Linn. Three specimens.
8. **Coccyzus minor** (Gmel.). Three specimens.
9. **Tinnunculus caribæarum** (Gm.). One specimen.
10. **Chamæpelia passerina** (Linn.). Nine specimens.

II.—Island of Trinidad (January 30–February 2, 1884).

1. **Certhiola luteola**, Licht. One specimen.
2. **Tanagra sclateri**, Berlepsch. Two specimens.
3. **Tanagra palmarum** (Max.). Two specimens.
4. **Tachyphonus melaleucus** (Sparm.). One specimen.
5. **Tyrannus melancholicus**, Vieill. One specimen.
6. **Contopus brachytarsus**, Scl. One specimen.
7. **Thamnophilus atricapillus** (Gm.). One specimen.
8. **Diplopterus nævius** (Gm.). One specimen.
9. **Steatornis caripensis**, Humb. Two specimens. (Mona Island.)
10. **Engyptila verreauxi** (Bp.). One specimen.
11. **Pelecanus fuscus**, Linn. Two specimens.
12. **Fregata aquila** (Linn.). Two specimens.
13. **Sula leucogastra** (Bodd.). One specimen.
14. **Sula piscator** (Linn.). One specimen.
15. **Sterna maxima** (Bodd.). One specimen.

III.—Island of Curaçoa, Venezuela (February 10–18, 1884).

1. **Mimus gilvus rostratus**, subsp. nov.

Subsp. char.—Similar to true *M. gilvus*, but with much larger bill, the lower parts more purely white, with no grayish shade across the jugulum, and the upper parts lighter gray. ♂ (type, No. 97927, U. S. Nat. Mus.): wing, 4.35; tail, 4.90; graduation, .80; all the feathers tipped with white, that on outer feather 1.40 in length, measured along inner side of shaft; culmen, 1.05; bill from nostril, .65; depth at base, .30; tarsus, 1.30; middle toe, .82. ♀ (type, No. 97928, U. S. Nat. Mus.): wing, 4.20; white on inner web of outer tail-feather, 1.25; culmen, 1.00; bill from nostril, .62; depth at base, .28; tarsus, 1.28; middle toe, .85.

2. **Dendroica rufopileata**, sp. nov.

Sp. char.—*Adult* ♂ (type, No. 97930, U. S. Nat. Mus.): Forehead and crown uniform chestnut-rufous, abruptly defined all round. Upper parts yellowish olive-green, the wings slate-dusky, with broad and distinct pure yellow edgings on greater wing coverts and tertials, the outer webs of the former being almost wholly yellow; primaries and secondaries narrowly edged with olive-yellow. Inner webs of rectrices (except middle pair) wholly clear primrose-yellow; outer webs dusky, edged, especially on lateral feather, with yellow. Sides of head (including lores and superciliary region back to above auriculars) and entire lower parts, pure gamboge-yellow, the jugulum and breast broadly, but not very sharply, streaked with rufous. Bill black, legs and feet brownish. Wing, 2.30; tail, 2.00; culmen, .50; depth of bill, .14; tarsus, .75; middle toe, .40.

Adult ♀ (type, No. 97931, U. S. Nat. Mus.): Differing from the male in lacking any trace of rufous on crown or streaks on breast. Yellow beneath decidedly less pure. Bill light brownish, the maxilla dusky.

Wing, 2.30; tail, 2.00; culmen, .45; depth of bill, .12; tarsus, .75; middle toe, .42.

The nearest ally of this species is *D. capitalis*, Lawr., of Barbadoes, which differs in having the pileum of a very dark, rich chestnut, in having the entire sides and flanks, as well as the breast, sharply streaked with rich chestnut, the yellow of the lower parts and the olive-green of the upper surface much deeper, and the bill much stouter.

There are two males and two females in the collection.

3. Icterus curasoënsis, sp. nov.

SP. CHAR.—Similar to *I. xanthornus* (Gm.), but with the bill much longer, more attenuated, and more acute, the white markings of the wings much broader, and the yellow color paler. *Adult ♂* (type, No. 97913, U. S. Nat. Mus.). Lemon-yellow, including lesser and middle wing coverts, rather deeper beneath, especially on the breast and sides of jugulum, the back and scapulars with a very faint olivaceous tinge. Lores, extreme anterior portion of malar region, chin, throat, wings (except lesser and middle coverts), and tail, black. Greater wing-coverts broadly tipped and tertials broadly margined with white; secondaries more narrowly, but still very distinctly, margined with white, but the white extending not quite to the tips of the coverts; second to fifth primaries, inclusive, broadly edged with white at the base, the white extending for .45 of an inch beyond the tips of the primary coverts on the third quill; all the primaries, except the first, narrowly edged with white from about the middle portion to the tip. Three outer tail-feathers narrowly bordered at tips with grayish-white, and all the rectrices with an inch (more or less) of their basal portion pale lemon-yellow, more whitish on inner web, the shaft of this portion of the feathers being pure white. Bill deep black, the basal angle of the mandible plumbeous; legs and feet dark plumbeous. Wing 3.70, tail 3.70, graduated for .60 of an inch; culmen 1.10, bill from nostril .80, from basal angle of mandible 1.08, depth of bill through base .50; tarsus 1.00, middle toe .70.*

The examination of specimens of *I. xanthornus* in this connection renders desirable some remarks on the latter species. In Dr. Sclater's recent review of the *Icterinæ*† (Ibis, July, 1883, pp. 368, 369), the habitat of *I. xanthornus* is given as follows: "Coast-region of Colombia and Venezuela, Trinidad, Guiana, and Rio Negro. Santa Marta (*Simons*); Carupano, Venezuela (*Goering*); Demerara (*Brown*); Rio Brancho

* The measurements of the longest-billed specimen among five adults of *I. xanthornus*, from the main land of northern and eastern South America (Colombia to Brazil), are as follows: Wing 3.65, tail 3.65, culmen .88, bill from nostril .60, from basal angle of mandible .88, depth of bill through base .50, tarsus 1.05, middle toe .80. The shortest-billed example has the culmen only .75 of an inch long.

† A Review of the Species of the Family Icteridæ.—Part II. Icterinæ. By P. L. Sclater, M. A., Ph. D., F. R. S. <The Ibis, 5th ser., vol. I, No. 3, July, 1883, pp. 352–374, pl. xi. [*Icterus grace-annæ*, CASS.] (Continued from p. 163.)

(*Natt*), while among the synonyms there is no mention of *Oriolus mexicanus* (part) LINN., ed. 12, p. 162, No. 13, *Icterus xanthornus* var. *α. dubusii*, DUBOIS, *I. x.* var. *β. marginalis*, DUBOIS, *I. auratus*, CASS. (*nec.* BP.), and *Xanthornus nigrogularis*, HAHN, all of which (with possibly the exception of the last) appear to be referable to the present species. The U. S. National Museum possesses a skin (No. 32769), from Verreaux, which, on the label, is marked as from "Mexique," and which corresponds exactly with DUBOIS' "var. *β. marginalis*," which is stated to have come from Panama; also a skin which I selected from a collection of Guatemalan birds (in the hands of a dealer), which, although it may not have really come from that country, nevertheless seemed to agree in "make" with the other skins, is different from any South American examples, and, furthermore, agrees in certain characters with the skin said to have come from Mexico. The latter is the specimen noticed by Mr. Cassin (as below) under the name "*auratus*," and bears this name, in his handwriting, on the label. On the same label are also inscribed, "*Icterus xanthornus*, DAUD.," by Verreaux, and "*Icterus nigrogularis*, BONAP.," by Mr. Lawrence. The specimen in question differs from all South American examples of the species in the National Museum (six in number) in the following particulars: (1) Large size, the wing measuring 4 inches, the tail 3.90, against 3.70 and 3.70, respectively, the *maximum* in the South American series; (2) decidedly purer yellow color of the back, which is hardly less clear in color than the breast, all the South American skins having a more or less olivaceous tinge on the dorsal region; (3) distinct white speculum at the base of the primaries, extending backward for nearly half an inch beyond the tips of the primary-coverts. As to the last-mentioned feature, most of the South American examples* have more or less of an indication of this white speculum; but in none is it nearly so large, while the white edgings to the secondaries are also less conspicuous, although the approach is quite near in two of them. These white markings are, however, very variable in their extent and development in different individuals, not only of this species but many others also, and they also vary in distinctness according to the age of the feathers, becoming in very old feathers so much abraded as to have almost disappeared, except where broadest. As a character, therefore, they need scarcely be taken into account.

The specimen supposed to be from Guatemala I should be disposed to refer to the same form as the one said to have come from Mexico, apart from any circumstantial evidence as to its origin, on account of

* These are from the following localities:

(1) No. 60592, ♂ ad. Forte de Rio Brancho, Brazil, Dec. 8, 1831; J. Natterer.
(2) No. 32776, ♂ ad. Rio Negro; Verreaux.
(3) No. 32775, ♂ juv. Rio Negro; Verreaux.
(4) No. 55196, ♂ ad. Demerara, Br. Guiana; P. Figyelmesey.
(5) No. 32777, ♀ ad. Cayenne, Fr. Guiana; Verreaux.
(6) No. 28161, ♂? ad. Sta. Marta, Colombia; G. N. Lawrence.

the fact that it agrees with the latter in the rich and nearly pure yellow of the back, and large size, although the dimensions are but little greater than those of the largest of the South American series, the wing measuring 3.90 and the tail 3.75 inches.

In conclusion, assuming that there may be two separable races of this species belonging respectively to Middle America and Northern South America, east of the Andes—a point regarding which I must confess myself as not quite satisfied—their synonymy may be arranged as follows:

ICTERUS XANTHORNUS.

α. xanthornus.

Oriolus mexicanus (part) LINN. S. N. ed. 12, i, 1766, 162, No. 13, but not No. 8, on same page (based on EDW. pl. 243=*I. leucopteryx*, and *Xanthornus mexicanus* BRISS. Orn. ii, pl. 11, fig. 2=the present species).—BODD. Tabl. P. E. 1783, 1 (based Pl. Enl. No. 5, fig. 1).

Icterus mexicanus "BRISS." Bonap. Compt. Rend. 1853, 835.—PREVOST & LEMAIRE, Ois. Ex. 131, pl. 70, upper fig.

Oriolus xanthornus GMEL. S. N. i, 1788, 391 (=*Oriolus mexicanus* No. 13, LINN.+Pl. Enl. No. 5, fig. 1).

Icterus xanthornus, DAUD. Tr. Orn. ii, 1800 334, (part; includes *I. leucopteryx*).

Agelaius xanthornus VIEILL. Nouv. Dict. xxxiv, 1819, 543 (part).

Psarcolius xanthornis WAGL. Syst. Av. 1827, No. 15 (first elimination of *I. leucopteryx*).

? *Icterus xanthornus*, var. *α. dubusii*, DUBOIS, Bull. Ac. Roy. Belg. ser. 2, xl, Dec. 1875, 16 (Isth. Panama).

Icterus xanthornus, var. *β. marginalis*, DUBOIS, Bull. Ac. Roy. Belg. ser. 2, xl, Dec. 1875, 17 (Isth. Panama).

Icterus auratus CASS. Proc. Philad. Acad. 1867, 50 (Mexico; spec'n in Nat. Mus. coll.).

β. linnæi.

Agelaius xanthornus VIEILL. Nouv. Dict. xxxiv, 1819, 543 (part).

Xanthornus linnæi BONAP. Consp. i, 1850, 434(Cayenne; "Antilles"; Colombia).

? *Xanthornus nigrogularis* HAHN, Vög. pt. v, 1820, 1, pl. 1 ("Mexico")—BONAP. Compt. Rend. 1853, 835.

Icterus xanthornus CABAN., in Schomb. Guiana, iii, 1848, 680; Mus. Hein. i, 1851, 185 (Venezuela; Guiana).—BURM., Syst. Ueb. iii, 1856, 269.—SCL., Catal. 1861, 133, No. 808 (Trinidad; Cayenne; New Granada); Ibis, 1883, 368 (coast-reg. of Colombia, Venezuela, and Guiana, to the Rio Brancho, Trinidad).—TAYLOR, Ibis, 1864, 84 (Trinidad).—CASS., Pr. Phil. Ac. 1867, 50 (Venezuela; Trinidad; Cayenne; N. Brazil).—SCL. & SALV., P. Z. S. 1868, 167 (Venezuela); Nom. Neot. 1873, 36.—WYATT, Ibis, 1871, 329 (Sta. Marta, N. G.).—SALVIN & GODM. Ibis, 1880, 123 (Sta. Marta, Colombia).—FINSCH, P. Z. S. 1870, 578 Trinidad).—PELZ. Orn. Bras, 1871, 195.

4. **Zenaida ruficauda**, Bonap.?

Or sp. nov. *Zenaida vinacco-rufa*, Ridgw.?

An adult female *Zenaida* (No. 97933, U. S. Nat. Mus.) is perhaps referable to Bonaparte's *Z. ruficauda* (Consp. II, 1854, 83), described as from

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New Granada, but differs in several respects from the description of that species. In the first place, there are fourteen rectrices, which would make it referable to the so-called genus *Zenaidura*, which includes another short-tailed species, the *Z. yucatanensis*, LAWR. from Merida, Yucatan (*cf.* "The Auk," Jan., 1884, p. 96). In the second place, the markings on the side of the head do not agree. Bonaparte (*l. c.*) says: "Nucha plumbea, macula suboculari, vittaque postoculari, albo-limbata, nigro-violaceis." The bird before me has the nape grayish brown, like the pileum; the postocular streak and subauricular (not subocular) spot are black (the latter glossed with steel-blue), and wholly destitute of white or light colored edgings. In view of possible specific or subspecific difference from *Z. ruficauda* I give herewith a full description of the Curaçoa specimens, and, if distinct, would propose for it the name *Zenaida vinaceo-rufa*.

Adult ♀ (No. 97933, U. S. Nat. Mus.): Upper parts grayish brown, becoming more decidedly brown on the tertials and posterior scapulars; primaries dusky, very narrowly edged with whitish; two innermost tertials and corresponding greater wing coverts marked with a longitudinally oval spot of black. Middle pair of tail-feathers and basal two-thirds (approximately) of other rectrices grayish brown (the inner web decidedly gray), this color bounded terminally by a black bar (broadest on inner web), the remaining portion of the rectrices rich cinnamon-rufous; outer web of lateral tail-feather without the black bar, cinnamon-rufous, fading into light vinaceous basally. Forehead and sides of head light isabella-brown, with a slight tinge of vinaceous, fading into buffy whitish on chin and upper part of throat. A postocular black line bordering upper edge of auriculars, and beneath the latter a spot of glossy blue-black. Sides of the neck richly glossed with metallic solferino-purple, changing to golden. Lower parts brownish vinaceous, purer vinaceous posteriorly, where deepest on the crissum. Lining of wings, axillars, and flanks, bluish cinereous. Bill, black; feet, pale brownish (red in life?). Wing, 5.40; tail, 3.50, graduated for .90 of an inch; culmen, .55; tarsus, .85; middle toe, .80.

5. **Chamæpelia passerina** (Linn.). Three specimens.
6. **Ardea herodias** (Linn.). One specimen.

IV.—SABANILLA, NEW GRANADA (March 16–27, 1884).

1. **Ceryle torquata** (Linn.). One specimen.
2. **Chrysotis amazonica** (Linn.). Two specimens.
3. **Ochthodromus wilsonius rufinuchus**, Ridgw. Two specimens.
4. **Ægialites semipalmata**, Bp. One specimen.
5. **Ereunetes pusillus** (Linn.). Two specimens.

6. **Ereunetes occidentalis**, Lawr. One specimen.
7. **Totanus melanoleucus** (Gmel.). One specimen.
8. **Phalacrocorax brasiliensis** (Gmel.). One specimen.

V.—Island of Old Providence, Caribbean Sea, 250 miles north of Aspinwall (April 4–9, 1884).

1. **Certhiola tricolor**, sp. nov.

Sp. char.—Similar to *C. bahamensis*, but larger, the upper parts darker, yellow on rump more extended, and posterior lower parts pale yellowish. *Adult* ♂ (type, No. 97844, U. S. Nat. Mus.): Above dull black, including the whole of the exposed portion of the tertials and secondaries. A broad and very distinct superciliary stripe of pure white, extending from the nostrils to the occiput; primaries with a large basal speculum of white, extending for about .40 of an inch beyond the ends of the coverts; basal half of inner web of all the secondaries pure white; three outer tail-feathers broadly tipped with white. Lower half of rump lemon-yellow. Broad band on side of head, involving lores and auriculars, and passing beneath but not above the eye, black; this band much narrower anteriorly, and gradually widening posteriorly, where confluent with the black of the nape. A small black line along the lower edge of the rictus. Chin, throat, jugulum, and cheeks uniform grayish white; whole breast and upper part of abdomen lemon-yellow, changing to olive-gray on the flanks and dull yellowish white on anal region and crissum. Lining of wing pure white, the bend bright yellow. Bill, deep black; feet, dusky. Wing, 2.60; tail, 1.90; culmen, .55; depth of bill at base, .20; tarsus, .80; middle toe, .50.

Young, first plumage (type, No. 97845, U. S. Nat. Mus.): Above dull grayish brown, the back indistinctly clouded with dusky, the forehead mostly dull black (new feathers); rump dingy olive-yellow. An indistinct superciliary stripe of pale dingy yellow, becoming nearly white anteriorly. A narrow loral stripe of dusky passing beneath the eye, but changing to dull grayish brown, and continuing, broadly, over the auriculars to the nape. Lower parts dingy olive-yellow, brighter on the breast and upper part of abdomen; anal region and crissum pale buffy yellowish. Lining of wing pure white, changing to yellow along the edge of the wing. Wing-speculum smaller than in the adult, but still very conspicuous.

It is somewhat remarkable that the nearest ally of this species should be the Bahaman *C. bahamensis*. It requires comparison with no other, except, perhaps, *C. caboti*, Baird, of Cozumel Island, Yucatan, which I have not been able to examine in this connection.

2. **Vireosylvia grandior**, sp. nov.

Sp. char.—Largest known species of the genus, somewhat resembling *V. barbadense*, but much grayer, the submalar streak much narrower,

and bill altogether larger and stouter. *Adult ♂* (type, No. 97846, U. S. Nat. Mus.): Pileum and nape brownish gray, the first darker laterally, but the dusky hardly forming a distinct streak; the gray of the nape gradually assuming a more olive tinge on the back, this increasing in intensity posteriorly, the rump and tail being decidedly olive-greenish. A distinct superciliary stripe of pale brownish gray, or dull grayish white, bordered beneath by a loral and postocular streak of dusky gray; auriculars and sides of neck pale olive-grayish, fading gradually into dull white on malar region, chin, and throat; the latter bordered on each side by a narrow line of dusky gray. Remaining lower parts dull white medially, light greenish olive laterally, the anal region, crissum, and inner edges of rectrices pale buffy yellow; lining of wing white, tinged with sulphur-yellow; a very faint brownish gray shade across the jugulum. Maxilla brownish black, paler along tomium; mandible pale browish yellow (plumbeous in life?); feet horn-color (plumbeous in life?). Wing, 3.35; tail, 2.90; culmen, .85; bill from nostril, .50; depth of bill at base, .28; width, .30; tarsus, .85; middle toe, .50.

3. **Vireo approximans**, sp. nov.

SP. CHAR.—Similar to *V. crassirostris*, Bryant, but rather paler above, the yellow supraloral streak much less distinct; the yellowish postocular spot obsolete, and tail more decidedly rounded or graduated. *Adult ♂* (type, No. 97847, U. S. Nat. Mus.): Pileum and nape brownish gray, changing to grayish olive on the back, the rump, upper tail-coverts, and outer web of rectrices more decidedly olive-greenish; wings dusky, the middle and greater coverts broadly tipped with yellowish white, and edged with olive; tertials broadly edged with dull whitish, the remaining remiges more narrowly edged with light olive-green, changing to pale grayish toward ends of the feathers. A broad and rather distinct supraloral stripe or bar of pale buffy yellow; upper eyelid with a bar of dusky grayish; a very indistinct brownish gray loral or anteorbital spot. Lower parts pale buffy yellow, paler on anal region and crissum, the sides grayish olive. Maxilla dark brown, mandible pale brownish (in dried skin); legs and feet dusky (plumbeous in life?). Wing, 2.45; tail, 2.20; graduated for .20 of an inch; culmen, .60; bill from nostril, .32; depth at base, .20; width, .23; tarsus, .90; middle toe, .45.

It is not a little remarkable that this species, like the *Certhiola* from the same locality, should have its nearest ally in a Bahaman species (*V. crassirostris*, Bryant). The resemblance to the latter is indeed so close that I hesitated to separate it, but finally concluded to do so upon the detection of certain characters which, though slight, do not occur in either of the four examples of *V. crassirostris* now before me. The latter present great variations in color, two of them being bright buffy yellowish beneath, with the supraloral bar intense sulphur- or lemon yellow, while the other two are dull buffy whitish beneath, with the supraloral mark pale dingy yellow. With these latter the present bird agrees most

closely in coloration, while its measurements compare with those of *V. crassirostris* and *V. ochraceus*, as follows:

	Wing.	Tail.	Culmen.	Bill from nostril.	Depth of bill.	Width of bill.	Tarsus.	Middle toe.	Graduate of tail.	National Museum number.
V. approximans	2.45	2.20	.60	.32	.20	.23	.90	.45	.20	97847
V. crassirostris	2.35	2.00	.55	.32	.....	.25	.85	.45	.05	13508
V. crassirostris	2.50	2.20	.65	.32	.20	.25	.85	.50	.10	74637
V. crassirostris	2.55	2.10	.65	.32	.20	.25	.85	.50	.10	74638
V. crassirostris	2.50	2.05	.68	.35	.20	.25	.85	.43	.12	80375
V. ochraceus	2.25	2.10	.60	.30	.18	.20	.80	.40	.20	97993
V. ochraceus	2.20	1.80	.....	.....	.....	.....	.80	.....	.....	(*)

* Measurements given by SALVIN & GODMAN in Biol. Centr. Am. Aves, I, p. 201.

The present bird certainly agrees much better, both in coloration and measurements, with *V. crassirostris* than with *V. ochraceus*, notwithstanding the latter is its nearer neighbor geographically.

4. Elainea cinerescens, sp. nov.

SP. CHAR.—*Adult* ♂ (type, No. 97849, U. S. Nat. Mus.): Upper parts deep brownish gray, without trace of olive tinge, somewhat lighter on the rump and browner on the upper tail-coverts; feathers of the central portion of the crown pure white beneath the surface; wings dusky, the greater and middle coverts broadly and distinctly, but not sharply, tipped with light brownish gray, passing into white at the margin; tertials broadly edged with grayish white, and secondaries narrowly margined with the same to within about .25 of an inch of the tips of the greater coverts; primaries very narrowly margined with whitish, becoming browner basally. Sides of head and neck uniform, slightly brownish, ash-gray, fading gradually into grayish white on the chin and throat, the entire sides and flanks, however, about the same shade as the sides of the neck, and jugulum distinctly, though not abruptly, pale grayish; abdomen and anal region white; lower tail-coverts pale grayish brown beneath the surface, the tips broadly white. Maxilla brownish black, mandible pale brown, tipped with blackish; legs and feet black. Wing, 3.45; tail, 3.30, forked for about .15 of an inch; culmen, .68; bill from nostril, .35; tarsus, .90; middle toe, .55.

Adult ♀ (type, No. 97848, U. S. Nat. Mus.): Similar to the ♂ in color. Wing, 3.15; tail, 2.90; culmen, .69; tarsus, .80; middle toe, .50.

This species is distinguished by its ashy coloration, there being no trace whatever of any olive or yellowish tinge. Its nearest ally is perhaps the Antillean *E. martinica* (Linn.).

CONTRIBUTIONS TO THE HISTORY OF THE COMMANDER ISLANDS.

No. 2.—Investigations Relating to the Date of the Extermination of Steller's Sea-cow.

By LEONHARD STEJNEGER.

Prof. A. E. Nordenskjöld in "The Voyage of the Vega" (New York, 1882, pp. 606—608) has given an account of the researches made by him on Bering Island, in order to throw light on the history of the extinction of the Northern Sea-cow (*Rytina gigas*), and from information obtained there, he thinks it "*proved*" that the statement of v. Baer and Brandt, that the Sea-cow became completely exterminated twenty-seven years after the discovery by Steller, or in 1768, is "undoubtedly incorrect." He even adduces "evidence" that "the death-year of the Rhytina race must be altered *at least to* 1854."

As to this latter statement, it was remarked in my preliminary report (Proc. U. S. Nat. Mus. VI., 1883, p. 84*) that I was compelled to regard it as erroneous, the promise being made at the same time to give my reasons based upon a thorough investigation, the detailed account of which is the object of the present paper.

It is proper, however, to remark at the outset, that it is a more or less hazardous business to draw scientific conclusions from statements like those made to Professor Nordenskjöld. In matters of this kind and so remote in time the memory of the natives is rather dull, and most of them have but faint ideas respecting the exact time and sequence of events much nearer the present times than those here in question. I should deem it unadvisable, even if nothing else pointed against Nordenskjöld's conclusion, to reject precise evidence almost contemporaneous with the event, because of such vague testimony.

As to the first proof of Professor Nordenskjöld, viz, the statement of a *creole*, 67 years of age, that his father, who died in 1847 at the age of 88, and who at the age of 18 (therefore in 1777), came to Bering Island, during the first two or three years of his stay there, that is, till 1779 or 1780, saw sea-cows feeding on sea-weed, my investigations have given somewhat different results, and I therefore quote my conversation with the same man in the very words taken down by me from his own mouth.†

"Pitr Vasilijef Burdukovskij says that he was born in 1819, and is therefore now (1882) 64 years old.‡ Having been asked why, in 1879, he

*In this place an important typographical error has occurred, the word "*natives*" in the fifth line from above having been erroneously used instead of "latter."

†In order to avoid errors on account of my rather imperfect knowledge of the Russian language, the kind assistance of Mr. Chernick, the agent of Hutchinson, Kohl, Philippeus & Co., was secured.

‡In the official list of the natives, his age is given as 61; this probably, however, being a mistake. His statement above seems to be correct, because he pretends to remember from his childhood the visit of Admiral Lütke on the island in 1828, what would hardly be probable, if he at that time had been only 6 years of age.

had said he was 67 years old, he denies this and says that Nordenskjöld's account rests on a mistake. His father, Vasilij Burdukovskij, died in 1842, at the age of 88 years.*

I told him that Nordenskjöld in his book gives the year of his death as 1847, but he maintains that 1842 is correct, and that he told Nordenskjöld so. He remarks, as to Nordenskjöld's statement that his father came from Volhynia, that he expressly said *Vologda*, his father being originally a native of the town Lalsk of that province.† The statement that he was 18 years old when he arrived at Bering Island is correct.

He remembers but very little of what his father told him about the sea-cow, but recalls that nothing else than the kidneys were eaten, and that the hide was used for "*bajdará*," but no *bajdará* covered with the hide of the sea-cow lasted so long that he himself has ever seen one or even the remnants of one. I asked him repeatedly if the sea-cows were not killed in order to get at the heart, but he answered every time that it was for the sake of the kidneys (*Russ.* почки‡), and that Nordenskjöld has misunderstood him. Nordenskjold's statement that the hide was so thick that it could be split in two, one hide thus being sufficient for one *bajdará*, is equally erroneous. The hide was thinned down but not split,§ and for a twelve-man *bajdará* two hides were required. He does not understand how Nordenskjöld can have misunderstood him so completely." Such was his statement, written down *verbatim*, with Nordenskjöld's book at hand, and its greater correctness compared with that reported by Nordenskjöld is corroborated by several other facts and statements mentioned in the foot-notes. Burdukovskij is still in full possession of his mental and physical faculties.

Recalculating Nordenskjöld's computation we arrive at the following conclusions: Vasilij arrived at Bering Island in 1772 (or 1770, if Volokitin's statement of his age is the correct one), and if, during the first two ‖ years of his stay there, he really saw living sea-cows, this animal has been in existence until 1774 (eventually 1772), or 6 (4) years longer than supposed v. Baer and Brandt.

However, if we consider that Vasilij was sixty-five years of age when

* This statement is corroborated by Mr. Volokitin, who asserts that old Burdukovskij had been dead five years, when he (V.), in 1847, came to Bering Island. He gives his age as 90 years. Mr. Volokitin's statements are fully trustworthy.

† I have seen here a page of an old journal containing *inter alia* that "Vasilij Burdukovski, from Lalsk," died in the same year as the journal was written. Unfortunately the page is without date, but the year 1841 is mentioned in another place in such a connection as to make it probable that the journal was written in the year following.

‡ Steller gives the weight of the kidneys as more than 30 pounds.

§ Compare Steller's statement, that the true skin "ist etwas dicker als eine Ochsenhaut." That the hide was "thinned down," probably means that the exterior crust, which was about an inch thick, and consisting of coalescent hairs(?), was removed.

‖ Burdukovskij says, "two or three years"; we would hardly be justified in adopting the larger figure.

his son was born, and that consequently the latter hardly has any recollection of stories told earlier than the seventy-third year of his father; further, that he was only 23 years of age when his father died, and that in 1879 (the year in which Nordenskjöld visited the island) thirty-seven years had passed, it will not be unreasonable to suppose, that the statement of the father of what he had heard about the sea-cows, shortly after his arrival at the island, in the course of so long time, intentionally or unintentionally, took such a form as if he had seen the sea-cow himself. Or, it may well have been, that Vasilij, who arrived four years after the last sea-cow was killed, and consequently during his early residence must have heard many accounts about this remarkable animal, retold them so often, that at last he even convinced himself that he had shared in the interesting events! It may be that, being a fur-hunter and adventurer, he possessed a touch of the bragging tendency common to those people, so as not to be especially particular about such trifles, as to report himself as an eye-witness, even if it was not literally true, and, as everybody knows, a story thus receiving weight and authority is much more interesting than one merely recorded at second-hand. Besides, it is not to be overlooked, that there was nobody living on the island who could contradict him.

That we are justified in interpreting his statement in the manner above indicated is, moreover, evident from the fact that Dmitri Bragin, who wintered on Bering Island *the same year Vasilij arrived* there (1772), and kept a journal during his stay at the request of Pallas, enumerates all the large sea-mammals of the island, *with the exception of the sea cow*. To an unprejudiced mind this would seem to prove that the animal not only was exterminated at that time, but had been extinct for some years.

And now I think we are through with the first evidence.

About the sea-cow which, according to Nordenskjöld, was said to have been seen about the year 1854, I made a thorough investigation, with the kind assistance of Mr. Chernick. I have given it below *verbatim*. I need hardly say, that both witnesses were examined separately, so that the one should not know the statements of the other. The questions were written down *beforehand*, and so constructed that they would give no clue to the answer: they were asked exactly as they are written, and the witness was given ample time for a well-considered answer. *Without taking precautions of this kind, it would be comparatively easy to get such people to answer a question in the manner one might desire.*

I then first examined Nicanor Pauloff Stepnoff, a creole, 58 years old, and asked him as a first *question:*

Question 1. In what year did you see the sea-cow?

Answer. I do not remember the time exactly, but it was when Gutkoff* was the agent of the station.

* I am informed by Mr. Volokitin, that Gutkoff left the island in 1847, and that the so-called sea-cow was seen in 1846, the year before he himself (V.) arrived there. As already stated, I know Mr. Volokitin sufficiently to accept his statements as correct.

Question 2. At what part of the island did you see it?

Answer. At the "Nepropusk" (all places are so named where the high land ends so abruptly in the sea that passage on foot below, along the water's edge, is very difficult or altogether impossible, the one here in question being always passed below), between Tolstoj Mys and Komandor (the place where Bering died).

Question 3. At what time of the year?

Answer. Late in autumn; during the time of the fox-hunting, in October or November; snow had not fallen yet. [The season of the fox-trapping is from the first of October to the end of December.]

Question 4. How far were you from the animal?

Answer. About as far as from here down to the anemometer. [30 to 40 paces.]

Question 5. How was the weather? Was it high or low water?

Answer. The weather was fair. As the sea is deep there, I cannot tell whether it was high or low tide.

Question 6. How did it happen that you met the animal?

Answer. We were *en route* to Komandor from Tolstoj Mys, when the animal came across us at Nepropusk.

Question 7. For how long a time did you see the animal?

Answer. Only for a very short time; we saw it only as it rose for a moment, and it immediately dived again.

Question 8. Describe how it dived. Did it disappear completely under the water?

Answer. Yes, it did. [Describing its diving he illustrated it by a motion of his hand, distinctly imitating the manner in which the toothed whales move in the water. He added expressly, that "the animal showed the whole tail above the water when going down." Of course, I took the opportunity of asking]

Question 9. How was the tail fin shaped?

Answer. Exactly like that of a whale ("*kit*"), but rather small.

Question 10. Could you see the fore-legs?

Answer. No!

Question 11. Did you say, when you described how it dived, that it blew out a "fountain" (*fontanka*)?

Answer. Yes! When lifting the head up it spouted out water about as high as that: [Showing with the hand about four feet above the ground.]

Question 12. Whence did the jet rise, *i. e.*, from what part of the head?

Answer. From the top of the head, behind and above the eyes.

Question 13. Are you sure that it did not come from the nose or the mouth?

Answer. Quite sure.

Question 14. How as to the back fin?

Answer. It did not have any fin on the back.

Question 15. What was its color?

Answer. It was whitish [*hjele*, perhaps more correctly, light], about the same color as this table, [the table had a yellowish leather color; I now showed to him a scale of colors, and on this he, without hesitation, pointed out a quite light shade of "burnt umber," adding that the animal was], densely sprinkled with round blackish spots, which were about 6 inches long.

Question 16. How long do you estimate the animal to have been?

Answer. About as long as this room [14 feet], or perhaps six fathoms [about 18 feet]. It was so lean that we could see all the bones.

Question 17. What did it eat?

Answer. We did not see it eat; we only saw that it came up and went down three times.

Question 18. Does "*kapusta*" [sea-weed] occur at that place?

Answer. No; there is very deep water.

Question 19. Did the animal then swim away from you?

Answer. Yes; when it dived the third time, we saw the last of it. I would have shot at it, but it did not come to the surface again, although we were waiting for a long time. We even returned to Tolstoj in order to try to get sight of it again, but without result.

Question 20. Could you see far over the sea from the place where you were standing?

Answer. We could see over the sea both along the coast and out ahead as far as the eye could reach, but without seeing it any more.

I now placed before him the figure of the sea-cow accompanying Brandt's book, about which he made the remark that the nose was too blunt and short, it being on the animal seen by him protracted into a snout "similar to that on the skeleton of the sea-cow."

Postponing my remarks till I have finished the examination of both witnesses, I take the liberty to introduce the second one, Fedor Ivanoff Merschénin, Aleut, and 61 years of age.

As the very same questions were proposed to him, it will only be necessary to refer to their number. Besides, in the following account his answers are filled so as to be easily understood without direct comparison with the questions.

Answer 1. Does not remember the year—not even approximately. [Examining him more minutely, I gained the information that his son, who now is 36 years of age, at the time was quite a baby. It is here to be remarked that his statement was extremely uncertain, and that the age of the son, being taken from the census of the island, is subject to serious doubt.]

Answer 2. At the Nepropusk between Tolstoj Mys and Tschigatschiganakh [the Aleutian name of a small creek between Tolstoj and Komandor, sometimes called in Russian Nepropuski Reschka].

Answer 3. During the fox-trapping season, late in the year, probably a week before Christmas [old style; about Christmas, new style]. I remember very well that there was snow on the ground.

Answer 4. We were quite near the animal, only about as far as from here to the next house over there [about twenty to twenty-five paces].

Answer 5. It was a clear morning, with sunshine and a light wind.

Answer 6. The animal was there when we came to the place.

Answers 7 and 8. It was swimming to and fro, diving several times, wholly below the surface, absolutely in the same manner as a whale does. It was lying on its side for just one moment. Its movements when swimming and diving were very rapid.

Answer 9. As only the very extreme tip of the tail was visible, I am unable to say what shape it had.

Answer 10. Only one fore leg was seen when it was lying with its side up; it was short and rounded.

Answer 11. When coming to the surface it blew like a whale, spouting out water about 2 to 3 feet high, like a small "plavun" (*Ziphius*).

Answers 12 and 13. It did not lift the head out of the water, only the jet was visible. Nothing of the head could be seen.

Answer 14. The back had no fin.

Answer 15. [It is very remarkable that in describing the color he used the very same words as Stepnoff, and that on the color scale he pointed out the very same shade of color. The only difference was that he gave the color of the spots as dark brown: their form was rounded or somewhat oblong.]

Answer 16. As the animal could not be seen in its full length, it is difficult to estimate how long it was, but it may have been as much as 3 fathoms (about 18 feet).

[I told him that Stepnoff said that the animal was so lean that the single bones could be counted. At this he only laughed, thinking that impossible. Nevertheless, he himself had the impression that it was very lean, as he thought that he had seen the backbone protrude like a sharp ridge along the back.]

Answers 17 and 18. It did not eat *kapusta*, nor anything else, when we saw it.

Answer 19. Stepnoff would have shot it, but he waited in vain till it should appear again, as it was gone forever.

Finally, I asked him for his reasons why he considered this animal different from a small whale or a "plavun," to which he answered that the only thing he could think of was that it had no fin on the back like those.

Comparing these statements with those given by Nordenskjöld, the first idea will be that the accounts of the two men are very different in many essential points, while Nordenskjöld asserts that they agreed completely. It must, in this connection, be remarked that the statements of Merschénin were less precise than those of Stepnoff, his answers usually beginning with "I don't know." I, therefore, think it rather probable that his answers, if the words were put in his mouth, or if he heard Stepnoff give his evidence first, would have agreed with

those of the latter. On the other hand, those who know him best describe him as the more trustworthy of the two.

It will further be seen that only one of them had seen from what part of the head the water-spout was ejected, and that he said to me exactly the reverse of what is given in Nordenskjöld's work. The latter statement was translated for him, but he nevertheless insisted upon the correctness of his present account. The color is also given by Nordenskjöld as the reverse of what both told me, viz, as light with dark spots.

Nordenskjöld says further: "That the animal which they saw was actually a sea-cow is *clearly proved* both by the description of the animal's form and way of pasturing in the water, and by the account of the way in which it breathed, its color and leanness." The color and the way of its breathing have been considered above. The statements of both, as given by me, agree in that the animal only dived up and down, without pasturing or eating. And, as to the form, that it "was very thick before, but grew smaller behind." The description answers fully as well, or more so, to a whale as to the shape of the sea-cow, which Steller describes as having its greatest circumference round the middle of the body. The leanness itself is hardly a diagnostic mark, and we are justified in assuming that the extreme leanness of the sea-cow in the winter, as reported by Steller, first took place later towards the end of the season, as the result of the hardship undergone during the severe winter, and not at its beginning, as was the case in this instance. That the statement of the animal's appearance before Christmas is correct is evident from the fact that the fox-trapping ends the last day of December.

Finally, Professor Nordenskjöld says:

"As these natives had no knowledge of Steller's description of the animal, *it is impossible* that their statement could be false."

It is rather strange that Nordenskjöld forgets that a little earlier he had spoken of a man who, according to Nordenskjöld's own statement, in his early days had seen living sea-cows, and who died only seven years (in reality four years) before the conjectured last appearance. Such a scanty description as Nordenskjöld has reproduced could easily be made up from his stories and from tradition. But it is moreover a fact that those natives were not unacquainted with the earlier descriptions of the animal, as a copy of the plates accompanying Brandt's first "*Symbolæ Sirenologicæ*" were sent to the island as soon as published. The drawings were afterwards taken to Sitka.

In the meantime the statements of the two witnesses agree sufficiently to prove that the animal seen was not a sea-cow at all. The light color, as to which they agree so remarkably, the description of "the fountain," the movements when diving, and the total disappearance at last, are points especially conclusive. As to "the fountain," I lay no stress whatever on Stepnoff's statement that it originated from the top of the head. His description of the snout of the animal,

that it was protracted "as in the skeleton," shows perfectly where he has got his idea, and I believe, therefore, that Merschénin is right in saying that the head could not be seen at all, or only a very small part of it, but both of them describe the jet exactly as that of a whale, a likeness they both admitted and suggested. That the sea-cow, however, did not eject a regular spout in that manner is perfectly evident from Steller's mode of expression: "They lifted the nostrils out of the water, ejecting air and a little water with a noise similar to the snorting of a horse,"* a respiration *toto coelo* different from the graceful and characteristic spouting of the whales; but the fact that the animal could submerge itself totally, and that when diving it finally disappeared from the view of the men, is most conclusive. It is sufficiently evident from Steller's description that the *Rytina* was unable to dive†, even when wounded, in which case it only went out to sea, but never down to the bottom. It could keep its head under water for only about four or five minutes, when it was compelled to lift it above the surface to breathe. Had it been able to dive, it would have suffered less from the severity of the winter, especially the pressure of the ice, and it would not have been compelled to pasture in shallow water half walking, but could also have fed further out in the deep sea. That the animal, however, seen by the Bering Island natives dived like a whale, and disappeared in that manner, is beyond even the slightest shade of doubt. On this point their statements are absolutely conformable, unmistakable, and precise.

Nevertheless it may safely be assumed that those natives really saw an animal unknown to them. That they took it to be a sea-cow is perhaps less strange than that Nordenskjöld did so. It is therefore interesting to endeavor to find out what kind of animal it really was, for this purpose considering only those points, wherein both agree.

I think there can be but little doubt that the animal was a denticete about 14 to 18 feet long, without a fin on the back, and light brownish white, with round or oblong dark spots. Upon looking into the literature, we will find that this description exactly fits the female narwhal (*Monodon monoceros*). I make the following extract from Professor Lilljeborg's description of this species:‡ "Fin on the back wanting; length of body reaching 15 to 20 feet; the female has on each side of the upper jaw, in front, a small tooth, usually not visible outside of the alveole; according to Scoresby the color of the adult is white or yellowish white

* "Nares exserebant atque aërem et pauxillum aquæ cum strepitu equorum ruspatione simili efflebant." In "The Description of the Bering Island," he says: "Je nach einiger Minuten erheben sie den Kopf aus dem Wasser, und schöpfen mit Räuspern und Snarchen nach Art der Pferde frische Luft."

† "Half the body is *always* seen above the water," Steller, Beschr. Ber. Ins. N. Nord. Beitr. II, p. 294. That the *lamantin* or *manatee* is able to sink down to the bottom and rest there for a few minutes does not prove that the *Rytina* could do the same. Besides its movements, when descending, are by no means comparable with those of the diving whale.

‡ Sveriges och Norges Ryggradsdj, Däggdj, p. 996.

with large gray and blackish brown spots." Lilljeborg says further: "On the back, about in the middle of the body, is situated a longitudinal keel or ridge as a rudiment of the dorsal fin, rising above the back almost one inch through its whole length. The body is thickest at the beginning of this keel, tapering behind, and nearer to the tail strongly compressed, with a sharp edge above and below." This ridge is also very recognizable in the description of the natives, as also in Nordenskjöld's account, as the projecting "backbone" (the projecting crest of the *processus spinosi*), a feature forcing upon them the impression of great leanness.

I do not see any reason why the narwhal which occurs in the Arctic Ocean north of Bering Strait should not occasionally make its appearance as far south as Bering Island, as it is well known that on the Atlantic side it has sometimes visited the northwestern coast of Germany and the British waters.

It may thus be regarded as fairly proved that the unknown cetacean, which in 1846 was observed near the southern end of Bering Island, was a female narwhal. But, whatever it may have been, one thing is absolutely sure: *it was not a sea-cow!*

It will therefore appear that there is no reason for altering the year of the extermination, 1768, as already given by Sauer and accepted by v. Baer and Brandt, to a later date.

In the above investigation I have proceeded with great care and gone into rather protracted details, but I found it necessary to lay before the public the data in the case, to enable everybody to make up his own mind. I have had two reasons for so doing. The case itself is important and interesting. It would give rise to many conjectures and theories if it were taken for granted that a sea-cow could have roamed about invisible until 1854 (or 1846). But, besides this, I thought it most necessary to support my words by unquestionable proof in charging an authority like Professor Nordenskjöld with errors or mistakes. That he was not deceived intentionally by the natives,* I conclude, among other things, from the fact that the misunderstandings comprise other subjects besides the account of the sea-cow—thus, for instance, the color of the stone-fox and the number of fur-seals killed on Bering Island, as I have already shown. That a scientist of Nordenskjöld's well known thoroughness and merits could fall into those mistakes may, perhaps, be explained by the fact that in the hurry of the short stay at the island he was too impatient to wait for the often protracted and indefinite answers, therefore indicating what replies he expected or wanted, a hint most certain to be followed by the natives. Besides, his account seems to have been written down for the greater part from memory, the original notes having been either lost or insufficient.

SMITHSONIAN INSTITUTION, *January* 1, 1884.

* I regret very much that the words in my preliminary report (Contributions to the History of the Commander Islands, No. 1, Proc. U. S. Nat. Mus., VI, 1883, p. 84) can be misunderstood as if I thought the natives had deceived Nordenskjöld intentionally.

AN IDENTIFICATION OF THE FIGURES OF FISHES IN CATESBY'S NATURAL HISTORY OF CAROLINA, FLORIDA, AND THE BAHAMA ISLANDS.

By DAVID S. JORDAN.

About one hundred and sixty years ago (1724–'25) Mark Catesby visited the Bahama Islands, and published a series of large-sized colored engravings, accompanied by a brief descriptive text, of various animals and plants observed there. Numerous editions (1731–'50) of his work have been issued, some in English and French, others in German and Latin, all with the same plates. In the English edition is given the vernacular names of the animals in use in the Bahamas. These are reprinted, so far as the fishes are concerned, by Goode (Bull. U. S. Nat. Mus., V, 1876, p. 16), and from his paper they have been copied into the present one. Catesby's figures are of every degree of merit, from good to the very worst. Some are very carefully executed; others are evidently, either wholly or in part, drawn from memory. Small details, as the numbers of the fin-rays, are rarely attended to. These drawings have a considerable importance in our nomenclature, as various species of Linnæus and of other binomial writers have been based upon them.

The only coherent attempt at identification of the fishes described by Catesby has been made by Professor Goode in his valuable memoir on the fishes of the Bermudas (Bull. U. S. Nat. Mus., V, 1876, pp. 16, 17). Of the forty four species figured by Catesby, about twenty are positively identified, and several of the others doubtfully so. Most of these identifications are unquestionably correct. In this paper I attempt to increase the number of positive identifications. The fact that almost all of the English vernacular names given by Catesby are still in use for the same species among the fishermen of Key West (nearly all of whom have come from Nassau, in the Bahamas) is an important aid in their determination.

1. **Umbla minor, marina maxillis longioribus** (the BARRACUDA) = *Sphyræna picuda*, (Bloch & Schneider). (Tab. 1, f. 1.)

This is the basis of *Esox barracuda* Shaw. It is evidently intended for the common large *Barracuda* or *Picuda* of the West Indies, for which the name *picuda*, based on a figure of Parra, has priority.

2. **Vulpis bahamensis** = *Albula vulpes*, (L.). (Tab. 1, f. 2.)

This is the basis of *Esox vulpes* L., Syst. Nat., ed. X, 1758, 313. The figure is rather poor, but unmistakable. The name *vulpes* is the earliest binomial designation of this species.

3. **Perca marina gibbosa cinerea** (the MARGATE-FISH) = *Hæmulon gibbosum*, (Bloch & Schneider). (Tab. 2, f. 1.)

This drawing represents fairly well the species still called Margate-fish at the Florida Keys and Bahamas, the "Margaret Grunt" of Jamaica, *Hæmulon album* of Cuv. & Val.

In the twelfth edition of the Systema Naturæ, Linnæus described his *Perca chrysoptera* from a specimen of the fish called of late *Pristipoma fulvomaculatum*, sent him by Dr. Garden, from Charleston. To its synonymy he erroneously referred the present figure of Catesby. Still more erroneously, Cuvier & Valenciennes have identified both Catesby's figure and Linnæus's description with their *Hæmulon chrysopterum*, a species very different from the fish either of Linnæus or Catesby.

In 1801, under the head of *Calliodon gibbosus* (p. 313) Bloch & Schneider have a description, taken for the most part from Catesby's figure, with a few phrases from the Linnæan diagnosis, those points in which the latter disagrees from the figure being omitted. Both Linnæus and Catesby are quoted in the synonymy, but it is evident both from the specific name and from the description that Catesby's figure only is regarded as the type of *Calliodon gibbosus*. I therefore adopt the name *gibbosum* instead of *album* for the Margate-fish. The name *chrysoptera* can, of course, go only with the *Pomadasys*, where it will supersede *fulvomaculatus*.

4. Saurus ex cinereo nigricans (the SEA SPARROW-HAWK) = *Synodus fœtens*, (L.). (Tab. 2, f. 2.)

From Carolina. In the twelfth edition of the Systema Naturæ this is correctly referred by Linnæus to the synonymy of his *Salmo fœtens*, described from a specimen sent from Carolina by Dr. Garden.

5. Perca marina, pinna dorsi divisa (the CROKER) = *Micropogon undulatus*, (L.). (Tab. 3, f. 1.)

From Virginia and Chesapeake Bay. In the twelfth edition S. N. it is correctly referred to the synonymy of *Perca undulata*, sent from Carolina by Dr. Garden.

6. Perca marina rubra (the SQUIRREL) = *Holocentrum ascensione*, (Osbeck). (Tab. 3, f. 2.)

One of the best of Catesby's figures, but for some reason overlooked by Linnæus and Bloch. It is the basis of *Perca rufa* Walbaum. Later than Walbaum the names *matajuelo* and *longipinne* have been applied to this species, which is the common West Indian *Holocentrum*. Prior to Walbaum it had received the specific names *ascensione*, *pentacanthum*, and *sogo*. The name *ascensione* is the earliest and best of these, and it is probably as certainly identified, although Osbeck's description tells little more than that his fish was a *Holocentrum*. This species is the only one of the genus recorded from Ascension Island since the time of Osbeck's visit. (Günther, Shore Fishes Challenger Exp.)

7. Perca marina rhomboidalis fasciata (the PORK-FISH) = *Pomadasys virginicus*, (L.). (Tab. 4, f. 1).

In the tenth edition S. N., p. 294, made the type of a *Perca rhomboidalis*, in the synonymy of which the *Sparus striis longitudinalibus* of Brown (apparently *Diplodus unimaculatus*) is erroneously placed. In

the twelfth edition Catesby's fish and Brown's are both wrongly referred to the synonymy of *Sparus rhomboides*, a species sent by Garden from Charleston. The name *Sparus virginicus* L. (ed. X, p. 281) is prior to *Perca rhomboidalis*. Catesby's figure is poor, but the species is still called Pork-fish.

8. **Perca marina pinnis branchialibus carens** (the SCHOOLMASTER) = *Lutjanus caxis*, (Bloch & Schneider). (Tab. 4, f. 2.)

This figure is one of Catesby's worst. The fish, still called Schoolmaster at Key West and the Bahamas, is *Lutjanus caxis*, and the reddish coloration and yellow vertical fins of Catesby's figure suggest this species. The pectoral fins are, however, omitted, and the scales are unnaturally large. The figure seems to have been drawn from memory. Fortunately no binomial name appears to have been based on it.

9. **Perca marina venenosa punctata** (the ROCK-FISH) = *Epinephelus venenosus* (L.). (Tab. 5.)

Type of *Perca venenosa*, L., S. N., ed. X, p. 292.

This plate is a very satisfactory representation of the species still called Rock-fish or Yellow-finned Grouper. It is the *Trisotropis petrosus* of Poey. The Bonaci Cardinal (*Ep. cardinalis*) seems to be a deep-water variety of the same fish. The name *venenosa*, based on this figure, has priority over all others.

10. **Albula bahamensis** (the MULLET) = ? *Mugil curema*, Cuv. & Val. (Tab. 6, f. 2.)

A poor figure of some Mullet: probably *Mugil curema* (= *M. brasiliensis* auct. nec Ag.). This figure is referred by Linnæus (edition XII) to his *Mugil albula*, described from a specimen sent from Charleston by Dr. Garden. No specific name seems to rest on Catesby's figure.

11. **Perca marina capite striato** (the GRUNT) = *Haemulon plumieri* (Lac.). (Tab. 6, f. 1.)

An unmistakable though inexact figure of the common Grunt. It is wrongly referred by Linnæus to the synonymy of his *Perca formosa*, received from Charleston through Dr. Garden. This latter is *Serranus formosus* (= *Diplectrum fasciculare*). From this mistake of Linnæus has come the improper transfer of the Linnæan name *formosum* from the *Serranus* to the present species.

12. **Perca marina puncticulata** (the NEGRO-FISH) = *Epinephelus fulvus* (L.), var. *punctatus* (L.). (Tab. 7, f. 1.)

Type of *Perca punctulata*, L., S. N., ed. X, p. 291, and of *Perca punctulata* Gmelin.

This is a tolerable representation of the common "Nigger-fish" of the Bahamas, the brown variety of the species usually called *Epinephelus* or *Enneacentrus punctatus*—the *Serranus ouatalibi* and *guativere* of Cuv. & Val. The oldest specific name of the species is, however, that of *fulvus*, applied by Linnæus to the yellow variety.

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13. **Perca marina cauda nigra** (the BLACK-TAIL)=*Hæmulon melanurum* (L.).

Type of *Perca melanura*, L., S. N., ed. X, 294.

This is a comparatively excellent figure of the species called *Hæmulon dorsale* by Poey. Whether this species is now called *Black-tail* or not I do not know. There can, however, be no room for doubt that it is this species which is intended by Catesby, rather than *Lutjanus chrysurus* as Goode has supposed.

14. **Hirundo** (the FLYING-FISH)=*Exocœtus* sp. (Tab. 8, f. 1.)

This poor figure contains nothing by which the species can be guessed at. No binomial name has been based upon it.

15. **Perca Marina sectatrix** (the RUDDER-FISH)=? (Tab. 8, f. 2.)

Type of *Perca sectatrix*, L., S. N., ed. XII, 486, and of *Perca saltatrix* (misprint for *sectatrix*), S. N., ed. X, 293.

Undoubtedly intended for the young of *Cyphosus bosqui*. *Cyphosus* is now called Chub, and never, so far as I know, Rudder-fish. The story told by Catesby of his fish following ships in large schools to feed on slime from the rudder has also been told of the *Cyphosus* (*Pimelepterus*). This species may stand as *Cyphosus sectatrix*.

16. **Perca fluviatilis gibbosa ventre luteo** (the FRESH-WATER PEARCH)=*Lepomis gibbosus* (L.). (Tab. 8, f. 3.)

Type of *Perca gibbosa*, L., S. N., ed. X, 1758, 292.

In the twelfth edition of the Systema Naturæ it is erroneously referred to the synonymy of *Labrus auritus*. Catesby's figure evidently represents the species called *Pomotis vulgaris* and *Pomotis catesbyi* by Cuv. & Val. The name *gibbosa*, as Mr. McKay has already shown, must supersede *aureus* (Walbaum), *vulgaris* (C. & V.), and other later names. The *Labrus auritus*, described from a specimen from Philadelphia, seems, as Dr. Gill has several times shown, to be the long-eared Sun-fish, *Ichthelis rubricauda* of Holbrook.

17. **Turdus pinnis, branchialibus carens** (the MANGROVE SNAPPER)=*Lutjanus griseus* (L.). (Tab. ix.)

Type of *Labrus griseus*, L., S. N., ed. X, 283.

A very poor figure, evidently made from memory. Both the form and coloration, however, resemble the *Lutjanus caballerote* more than any other Bahama fish, slight as the likeness is. The name Mangrove Snapper gives us an important clew, as no species other than the *Caballerote* is known by this name to the Key West fishermen. The name Mangrove Snapper is very appropriate, as the young of this species swarm everywhere in the shelter of the mangrove bushes about the mangrove islands. I think, therefore, that, in view of the persistence

of these common names, the identification of *Labrus griseus* with *Lutjanus caballerote* is warranted.

The name *caballerote* (*Anthias caballerote* Bloch & Schneider) rests on a basis precisely similar, inasmuch as the *cabellerote* of Parra could not be certainly identified were it not that the same fish is still called *Caballerote* by all Spanish fishermen at Cuba and Key West. The species is, in Florida, also often known as Gray Snapper, a fact which tends to increase the propriety of the name *griseus*.

18. Turdus Rhomboidalis (the TANG) = *Acanthurus caeruleus*. (Tab. 10, f. 1.)

Basis in part of *Chætodon caeruleus* Bloch. Little exact as this figure is, there can be no question as to its identification.

19. Turdus cauda convexa (the YELLOW-FISH) = *Epinephelus fulvus* (L.), yellow variety). (Tab. 10, f. 2.)

Basis of *Labrus fulvus*, L., S, N., ed. X, 287.

There is no doubt that Goode is right in identifying this figure with the yellow variety of *Serranus ouatalibi* C. & V., or *Serranus guativere* C. & V. It is the Guativere Amarilla of the Cuban fishermen. Both as regards form and coloration, this drawing is more exact than is usual with Catesby.

The name *fulvus* has priority over *punctatus* L., above noticed, and over all others, for this species, which must therefore stand as *Epinephelus* (or *Enneacentrus*) *fulvus*, the scarlet form being var. *ouatalibi* C. & V., and the brown form var. *punctatus* L.

20. Turdus flavus (the HOG-FISH) = *Bodianus rufus* (L.). (Tab. 11, f. 1.)

Type of *Labrus rufus*. L., S. N., ed. X, 284.

The name *rufus* has been long since adopted for this species, which is now generally known as the Spanish Hog-fish. Catesby's figure is not a bad one, although not doing justice to the bright coloration of the species.

21. Turdeus cinereus peltatus (the SHAD) = *Gerres cinereus* (Walb.). (Tab. 11, f. 2.)

Type of *Mugil cinereus*, Walbaum, Artedi Piscium, 1792, 228.

This picture is a fair representation of the common "Broad Shad" of the Florida Keys and Bahamas (=*Gerres aprion* C. & B.; =*Gerres zebra* M. & T.; =*Gerres squamipinnis* Günther). No other species of "Shad" (*Gerres*) with a low dorsal fin reaches anything like the dimensions of Catesby's figure. The latter cannot, then, be identified with *G. gula*, *G. gracilis*, or *G. lefroyi*.

22. Turdus Oculo radiato (the PUDDING-WIFE) = *Platyglossus radiatus*, (L.). (*Tab.* 12, f. 1.)

Basis of *Labrus radiatus*, L., S. N., ed X, 283.

In the twelfth edition of the Systema Naturæ it is erroneously referred by Linnæus to the synonymy of his *Sparus radiatus*, there described

from a specimen sent by Dr. Garden from Charleston. This *Sparus radiatus* is *Platyglossus bivittatus*. The name *Labrus radiatus* has priority, and must be retained for Catesby's species, which is the species called by many writers *Platyglossus cyanostigma*. Catesby's figure is not a bad one, and the name "Pudding-wife" is still in use for the species.

23. Alburnus americanus (the CAROLINA WHITING) = *Menticirrus alburnus*, (L.), or *Menticirrus littoralis*, (Holbrook). (Tab. 12, f. 2.)

Type of *Cyprinus americanus* L., S. N., ed. X, 321 afterwards, in the twelfth edition, referred to the synonymy of *Perca alburnus*, L., described from a specimen sent by Dr. Garden from Charleston.

Catesby's figure evidently represents a *Menticirrus*, although the second dorsal is omitted and several barbels (instead of one) are placed on the chin. I find nothing by which we may decide whether *M. alburnus* or *M. littoralis* is intended. The large mouth suggests the former, the plain coloration and pale pectorals the latter. Both are common at Charleston and both are called Whiting. Under the circumstances, I do not feel authorized to substitute the earlier name *americanus* for either *alburnus* or *littoralis;* but if we must choose, Catesby's figure is most like the latter.

24. Mormyrus ex cinereo nigricans (the BONE-FISH) = ? (Tab. 13.)

I am unable to identify this figure, nor does it appear to have been made the type of any specific name. The name "Bone-fish" is now universally applied to *Albula*, but Catesby leaves *Albula* without vernacular name, while he says of the present species that "it is common on the shores of the Bahama Islands, and, so well as I remember, is called Bone-fish." It is probable that his memory was at fault, and it is possible that the entire drawing was made from memory. It may possibly have been a *Gerres* (possibly *G. lefroyi*) which he had in mind.

25. Cugupuguacu Brasil (the HIND) = *Epinephelus apua*, (Bloch). (Tab. 14, f. 1.)

Referred by Linnæus to the synonymy of his *Perca guttata* L., S. N., ed. X, 292. This appears to be based especially on Willoughby's figure of Maregrave's Cugupugnacu. Maregrave's fish is *Epinephelus itaiara*, Willoughby's probably the *Epinephelus cruentatus*), (*coronatus*), while Catesby's is *E. apua*. I have thought best to retain the name *guttatus* with Bloch for Willoughby's fish, although the propriety of so doing is not free from question.

Goode's statement (l. c., p. 58) that the *Perca guttata* of Gmelin is based on this figure of Catesby is evidently a slip of the memory. The description given by Gmelin is copied exactly from Linnæus, who quotes in his synonymy Maregrave, Sloan, Willoughby, Ray, and Catesby, thus including at least three different species, *itaiara*, *apua*, and *guttatus* (*cruentatus*). All these writers appear to have (erroneously) identified their specimens with Maregrave's "Cugupugnacu."

26. **Saltatrix** (SKIPJACK) = *Pomatomus saltatrix*, (L.). (Tab. 14, fig. 2.)

Type of *Gasterosteus saltatrix*, L., S. N., ed. XII.

A tolerable figure of the well known Blue-fish, with which all writers have identified it.

27. **Suillus** (the GREAT HOG-FISH) = *Lachnolæmus suillus* Cuvier. (Tab. 15.)

Type of *Lachnolæmus suillus*, Cuvier, Règne Animal, ed. II, 1829.

A fair figure of the head of the male "Hog-fish." The oldest tenable name of this species seems, as already stated by Poey, to be *L. suillus*, Cuvier. *Labrus falcatus*, L. was probably a *Trachynotus*, certainly not a *Lachnolæmus*.

28. **Aurata bahamensis** (the PORGY) = *Calamus calamus*, (Cuv. & Val.). (Tab 16.)

Erroneously referred by Linnæus (S. N., ed. XII) to the synonymy of his *Sparus chrysops*, which is a *Stenotomus*, sent from Charleston by Dr. Garden. The brown spots on the preorbital region in Catesby's figure leave no doubt as to the species of *Calamus* intended by him.

29. **Salpa purpurascens variegata** (the LANE SNAPPER) = *Lutjanus synagris* (L.). (Tab. 17, f. 1.)

Type of *Sparus synagris*, L., S. N., ed. X, 280.

A good figure of the fish still known to the fishermen as Lane Snapper (*Mesoprion unimaculatus* Cuv. & Val.). The name of Linnæus has priority.

30. **Petimbuabo Brasil** (the TOBACCOPIPE-FISH) = *Fistularia tabacaria*, L. (Tab. 17, f. 2.)

Referred by Linnæus to the synonymy of his *Fistularia tabacaria*. Evidently the common West Indian species of *Fistularia*, usually identified as *F. tabacaria*, although as yet the synonymy of the species has not been critically studied.

31. **Novacula Cærulea** (the BLUE FISH) = *Scarus cæruleus*, Bloch. (Tab. 18.)

Referred by Bloch & Schneider to the synonymy of *Scarus cæruleus*. The latter seems to have been originally confused with other species, but has been properly restricted to the present one. This is one of the best of Catesby's figures. It does not appear to have been noticed by Linnæus, however.

32. **Unicornis. Piscis Bahamensis** (the BAHAMA UNICORN FISH) = *Alutera scripta*, (Osbeck). (Tab. 19.)

Referred by Linnæus to the synonymy of *Balistes monoceros*, S. N., ed. X, 327.

Not having studied this fish, I follow other authors in identifying the American fish with *A. scripta*.

33. **Muræna maculata, nigra et viridis** (the MURAY) = *Sidera* sp. (Tab. 20.)

Erroneously regarded by Linnæus as a variety of *Muræna helena*.

This figure may have been intended for *S. moringa*, but if so it is very poorly colored. Possibly *Sidera funebris* was intended, but that species is immaculate. No binomial name seems to rest upon it.

34. **Muræna maculata nigra** (the BLACK MURRY) = *Sidera moringa*, (Cuvier). (Tab. 21.)

Type of *Muræna moringa*, Cuvier, Règne Animal, ed. II, 1829.

This is, without much doubt, the common Moray (*M. moringa* auct., = *Gymnothorax rostratus*, Agassiz), although the spots are represented too small.

35. **Turdus oculo radiato** (the OLD WIFE) = *Balistes vetula*, L. (Tab. 22.)

Correctly referred by Linnæus to the synonymy of his *Balistes vetula*, brought by Osbeck from the island of Ascension. There is possibly some confusion in the Linnæan synonymy.

36. **Bagre secundæ Speciei Marggr. affinis** (the CAT FISH) = *Amiurus* sp. (Tab. 23.)

Referred by Linnæus to the synonymy of his *Silurus catus*, S. N., ed. X, 305.

Both figure and description are made from memory and are very inexact. The eight barbels, dark color, and forked tail make it probable that the species dimly intended was *Amiurus nivicentris*, but of this there is no possible certainty. The *Amiurus catus* of Linnæus rests on this figure, on a figure by Maregrave of some Brazilian species, and on a specimen from Asia. Nothing, apparently, can be made of it, and the name *catus* ought never to have been used for any American species.

37. **Harengus minor, bahamensis** (the PILCHARD) = probably *Clupea sardina*, (Poey). (Tab. 24.)

Erroneously referred by Linnæus to the synonymy of his *Argentina carolina*, Syst. Nat., ed. XII, 519, which is identical with the prior *Elops saurus*, L. Catesby's figure is very poor, but it most resembles the common *Clupea sardina*, which, with *Clupea pensacolæ*, *Clupea clupeola*, and other small species, goes by the name of Pilchard among the English-speaking fishermen.

38. **Anthea quartus Rondeletii** (the MUTTON FISH) = *Lutjanus analis*, (Cuv. & Val.) (Tab. 25.)

Erroneously referred by Linnæus to the synonymy of *Labrus anthias*, L.

A tolerable figure of the species still called Mutton-fish at Key West and the Bahamas and Mutton Snapper at Aspinwall. No binomial name seems to have been given to this figure.

39. **Remora** (the SUCKING FISH) = ? *Echeneis naucrates*, L. (Tab. 26.)

Referred by Linnæus in the tenth edition of the Systema to the synonymy of *Echeneis remora*, and in the twelfth to that of *Echeneis naucrates*. The short disk and thickish body resemble more *Remora remora* than *Echeneis naucrates*, but the latter species is by far the more common about the Bahamas, and the figure is evidently inexact.

40. **Solea lunata et punctata** (the SOLE) = *Platophrys lunatus*, (L.). (Tab. 27.)

Type of *Pleuronectes lunatus*, L., S. N., Ed. X., 269.

A tolerable figure.

41. Orbis lævis variegatus (the GLOBE FISH) = ? *Tetrodon testudineus*, L. (Tab. 28.)

The figure most resembles *T. testudineus*, but in the description reference is made to its occurrence in Virginia, which must allude to *T. turgidus*. No binomial name seems to have been given to this fish.

42. Psittacus piscis viridis. Bahamensis. (the PARROT FISH) = *Sparisoma catesbyi* (Lac.). (Tab. 29.)

Type of *Labrus catesbæi*, Lacépède.

A tolerable figure.

43. Acus maxima. squamosa. viridis (the GREEN GAR FISH) = *Lepidosteus osseus*. (L.). (Tab 30.)

Referred by Linnæus, with some doubt, to the synonymy of *Esox osseus*, L. Referred by Gmelin to *Esox viridis*, the latter name being given by Gmelin to specimens sent from Charleston by Dr. Garden to Linnæus.

Catesby's fish seems to have been *L. osseus* rather than *L. spatula*. This is shown not only by the poor figure, but in the description, which speaks of the long mouth, or rather beak, of the total length as three feet, and the habitat, Virginia.

The specimen sent by Garden to Linnæus, and which is identified by Linnæus with Catesby's figure, seems to be also *L. osseus*. It is this, rather than Catesby's figure, which is the proper type of *Esox viridis*, Gmelin. Neither seems, however, to be identical with the Alligator Gar, which should not, therefore, retain the name *Lepidosteus viridis*, used for it by Dr. Günther.

44. An Acarauna major pinnis cornutis, au Paru Brasiliensibus? (the ANGEL-FISH) = *Holacanthus ciliaris*, (L.). (Pl. 31.)

Type of *Chætodon squamulosus*, Shaw (Nat. Misc., p. 275).

A rough but unmistakable figure. Linnæus seems to have left it unnoticed.

RECAPITULATION.

The following binomial names are based directly on figures of Catesby. Those specific names which appear to be tenable by right of priority for the species to which they refer are printed in heavy type. The name of the modern genus to which each species belongs is placed after it in parenthesis. The order is that of Catesby:

Esox barracuda Shaw, 1803 ..... (*Sphyræna*)
Esox VULPES L., 1758 ..... (*Albula*)
Calliodon GIBBOSUS Bloch & Schneider, 1801 ..... (*Hæmulon*)
Perca rufa Walbaum, 1792 ..... (*Holocentrum*)
Perca rhomboidalis L., 1758 ..... (*Pomadasys* § *Anisotremus*)
Perca VENENOSA L., 1758 ..... (*Epinephelus* § *Mycteroperca*)
Perca punctata L., 1758 ..... (*Epinephelus* § *Enneacentrus*)
Perca punctulata Gmelin, 1789 ..... (*Epinephelus* § *Enneacentrus*)
Perca MELANURA L., 1758 ..... (*Hæmulon*)
Perca SECTATRIX L., 1758 ..... (*Cyphosus*.)

Perca GIBBOSA L., 1758.....(*Lepomis* § *Eupomotis*)
Labrus GRISEUS L., 1758.....(*Lutjanus*)
Chætodon CŒRULEUS Bloch, 1790 (about).....(*Acanthurus*)
Labrus FULVUS L., 1758.....(*Epinephelus* § *Enneacentrus*)
Labrus RUFUS L., 1758.....(*Bodianus*)
Mugil CINEREUS Walbaum, 1792.....(*Gerres*)
Labrus RADIATUS L., 1758.....(*Platyglossus*)
Cyprinus AMERICANUS L., 1758.....(*Menticirrus*)
Gasterosteus SALTATRIX L., 1766.....(*Pomatomus*)
Lachnolæmus SUILLUS Cuvier, 1829.....(*Lachnolæmus*)
Sparus SYNAGRIS L., 1758.....(*Lutjanus*)
Muræna MORINGA Cuvier, 1829.....(*Sidera*)
Pleuronectes LUNATUS L., 1758.....(*Platophrys*)
Labrus CATESBEI Lacépede, 1803.....(*Sparisoma*)

INDIANA UNIVERSITY, *May* 1, 1884.

A LIST OF FISHES COLLECTED IN THE EAST FORK OF WHITE RIVER, INDIANA, WITH DESCRIPTIONS OF TWO NEW SPECIES.

By CHARLES H. GILBERT.

The material on which the following list is based, was obtained by a day's seining with a fine-meshed net in the East Fork of White River, near Bedford, Lawrence County, Indiana, and by work in its tributary, Salt Creek, at various points, in Brown and Monroe Counties. White River is at that point a rather rapid, clear, shallow, stream, flowing over rock, gravel, and fine sand. Salt Creek is nearly everywhere sluggish, and flows between high steep clay banks.

The only list of the fishes of any Indiana stream which is even approximately complete, is that based on the collections of Professors Jordan and Copeland, in the West Fork of White River, at Indianapolis. Some differences will be noticed between that list and the present one, but these are possibly due to differences in the nature of the streams at the points examined.

1. **Noturus miurus** Jordan.

Exceedingly abundant in Salt Creek, where it was taken in great numbers at every haul of the seine. Also found in the channel of White River.

2. **Noturus flavus** Raf.

Almost equally common with the preceding

3. **Amiurus xanthocephalus** Raf.

Specimens of a small yellow cat-fish, apparently belonging to this species, were taken in Salt Creek, at Nashville, Brown County, Indiana.

The color is light bright yellow, with the membranes of the fins, especially the anal and caudal, blackish, thus contrasting strongly with the rays. Head rather narrow, its greatest width 1⅔ in its length; anterior

profile rising steeply to front of dorsal, without interruption at nape. Front of dorsal nearer adipose fin than snout. Maxillary barbel reaching beyond base of pectoral spine, the mental barbels to beyond margin of opercular membrane.

Head 3½ in length: depth 3¾ to 4. A. 18 or 19, its base 4¾ in length. Dorsal spine 2½ in head: pectoral spine 2¼. Eye 7½ in head. Interorbital: width slightly less than width of mouth, about 1½ head; length, 6 inches.

4. **Amiurus natalis** LeSueur.

Abundant in Salt Creek.

5. **Ictalurus punctatus** Raf.

Found in the open channel of White River; not seen by me in the smaller tributaries.

6. **Leptops olivaris** Raf.

Two young specimens from White River.

7. **Ictiobus carpio** Raf.

Common in White River.

8. **Catostomus teres** Mitch.

Abundant; especially in smaller tributaries.

9. **Catostomus nigricans** Raf.

Generally abundant.

10. **Erimyzon sucetta** Lac.

Found sparingly in Salt Creek.

11. **Moxostoma macrolepidotum** Les.

Found everywhere in large numbers.

12. **Moxostoma velatum** Cope.

White River.

13. **Campostoma anomalum** Raf.

Very common.

14. **Chrosomus erythrogaster** Raf.

Comparatively not abundant. Found in clear tributaries of Salt Creek.

15. **Pimephales notatus** Raf.

Very common.

16. **Hypargyrus*** **tuditanus** Cope. (34979.)

Hybopsis tuditanus Cope., Trans. Am. Phil. Soc. 1866, 381.

**Hypargyrus*, gen. nov. Forbes MSS., type *Hybopsis tuditanus* Cope.

Body short and high, somewhat elevated but not closely compressed. Caudal peduncle deep, truncate behind, the fin conspicuously short and broad. Head heavy, blunt; snout short, bluntly decurved; mouth terminal, with short, slightly oblique gape; maxillary reaching vertical from posterior nostril, its length equaling that of eye. Eye moderate, about equaling length of snout, and interorbital width, $3\frac{1}{2}$ in head (eye 3 in head in specimens of 2 inches and less). Teeth 4–4 with strong hook, and well-developed flattish grinding surface.

Scales rather small, smaller and more closely imbricated along anterior portion of lateral line; those in front of dorsal very small and much crowded (as in *Pimephales notatus*). Lateral line little decurved, rising anteriorly to shoulder.

Fins all small, the caudal especially short, less than length of head. First ray of dorsal ("rudimentary") simple and stiff, though distinctly articulated, and separated from the first branched ray by a membrane (as in *Pimephales*). Front of dorsal over or slightly behind insertion of ventrals; pectorals not reaching ventrals, the latter not to vent. Highest dorsal ray $1\frac{2}{3}$ in head.

Head 4 to $4\frac{1}{3}$ in length; depth 4 to $4\frac{1}{4}$. D. 8; A. 7. Lat. l. $42\frac{8}{6}$; about 28 scales before dorsal fin.

Olivaceous above, the scales except at the base covered with black punctulations; no dark vertebral line. A narrow plumbeous band along middle of sides, conspicuous and black in the young, and always terminating in a very distinct small black spot on middle of caudal base; a black blotch on opercle. Fins translucent; dorsal with a conspicuous black blotch on middle of anterior rays and usually with a transverse series of small, black spots above this.

This species, which had not been seen since it was originally described, was found in large numbers in the White River near Bedford, Lawrence County, Indiana. It has also been found by Prof. S. A. Forbes in Illinois. Adult males have a few well-developed tubercles on the snout in the spring.

17. Notropis* stramineus Cope.

A single specimen was found in White River.

18. Notropis boops sp. nov. (34982.)

Species with much the appearance of *Notropis rubellus*, but the body more elevated and compressed. Outline of back angulated at the front of dorsal, to which point the anterior profile rises in a straight line; caudal peduncle rather slender.

Premaxillaries anteriorly on a level with axis of body, which passes through the middle of the orbit. Snout short, not blunt. Mouth

* Under the earlier name, *Notropis*, I include the species referred to *Minnilus*, *Cliola*, and *Hemitremia* by Jordan & Gilbert, Synopsis Fish N. A., pp. 162–203.

terminal, very oblique, the upper jaw not projecting beyond the lower; Maxillary reaching vertical from front of orbit, $3\frac{1}{5}$ in head. Eye extremely large, from $2\frac{1}{2}$ (in specimens 2 in. long) to 3 (3 in. long) in head.

Teeth 1, 4–4, 1, with narrow, groove-like grinding surface, the inner edge of groove of the three largest teeth very strongly and coarsely crenate, the outer edge entire; tooth of inner row with well-marked grinding surface, but without crenations. The pharyngeal bones and teeth are slender and fragile.

Origin of dorsal fin directly over, or slightly in advance of, ventrals, a little nearer snout than base of median caudal rays. Highest dorsal ray $\frac{2}{10}$ length of head; equal to distance between insertions of pectorals and ventrals. Caudal fin equaling length of head. Pectorals scarcely reaching ventrals; the latter about to vent. Dorsal and anal fins with outer margins strongly concave, owing to length of anterior rays.

Scales large, loosely imbricated as in *N. stramineus;* lateral line complete, quite strongly decurved anteriorly, 12 or 13 scales in front of dorsal fin.

Head $3\frac{3}{4}$ in length; depth $4\frac{1}{5}$ ($4\frac{1}{2}$ in young). D. 8; A. 7. Lat. l, $36\frac{5}{2}$.

Color olivaceous on back, sides silvery, whitish below; scales of back narrowly and conspicuously margined with dusky; a very narrow, dark vertebral streak; head above with dusky areas. Middle of sides with a steel-colored streak formed by a band of coarse dark specks overlying the silvery; this band is continued forward across opercles and around front of snout. Fins unmarked; no dark points along base of anal.

This species is represented by 10 specimens from 2 to 3 inches long, taken at various points on Salt Creek, in Brown County, Indiana; and also by about 30 specimens taken by Mr. W. P. Shannon in Flat Rock Creek, Rush County, Indiana.

19. Notropis analostanus Grd.

Everywhere very abundant.

20. Notropis cornutus Mitch.

Apparently much less abundant in the East Fork of White River than in the West Fork.

21. Notropis diplæmius Raf.

Generally distributed.

22. Notropis rubrifrons Cope.

One specimen from White River.

23. Ericymba buccata Cope.

White River. Not seen in the tributaries.

24. Rhinichthys atronasus Mitch.

Not often seen.

25. Nocomis biguttatus Kirt.

Occasional.

26. Nocomis amblops Raf.

Abundant.

27. Nocomis hyostomus sp. nov. (34950.)

Body very slender, terete, little compressed, not heavy forwards, regularly tapering from the shoulders. Caudal peduncle very slender. Head slender: snout long, conic, rather sharp, 2¼ in length of head, projecting beyond mouth for a distance about equal to half its length from eye. Mouth inferior, horizontal, with short, wide gape, broad, rounded anteriorly: lips not thickened: maxillary extending slightly beyond vertical from front of eye, 3½ in head. Barbel long, conspicuous, thickened at base, its length about three-fifths diameter of eye. Eye small, in middle of length of head, very elliptical in shape, its vertical diameter equaling interorbital width and distance of nostril from tip of snout, 4 in head: longitudinal diameter of orbit 3¼ in head. Opercle small, its length longitudinally less greatest width of cheeks.

Teeth 4–4, strongly hooked, without trace of grinding surface.

Dorsal and anal rather small, not falcate, the origin of dorsal very slightly behind insertion of ventrals, midway between snout and base of caudal. Pectorals large and prominent, the insertion more nearly horizontal than usual in the Cyprinidæ. Longest dorsal ray 1½ in head; pectorals 1¼: caudal slightly less than head: ventrals reaching vent.

Scales large, 37 in lateral line, and 13 or 14 before dorsal. The scales are slightly crowded towards head, the series not converging towards back. Lateral line straight, or almost imperceptibly decurved anteriorly.

Head (3½ to) 4 in length: depth 5⅓ to 5¾: D. 8, A. 8, L. 2 to 2½ inches.

Color in life: Back light greenish, perfectly translucent; a silvery streak along lateral line with ill defined edges, widest forwards; body below whitish. Scales above minutely and evenly dusted with dark points; top of head with black areas; middle of sides of head and body thickly covered with black specks, which do not form a distinct dark lateral streak, as in *N. amblops*. Fins translucent; base of dorsal somewhat dusky; black points at bases of anterior anal rays.

All specimens examined have back and sides with scattered black parasitic specks of varying size.

Very abundant in White River, near Bedford, Lawrence County, Indiana.

28. Semotilus corporalis Mitch.

29. **Notemigonus chrysoleucus** Mitch.

Occasional.

30. **Umbra limi** Kirt.

A single specimen taken at a sluggish point in Salt Creek.

31. **Esox vermiculatus** Le Sueur.

Found abundant in Salt Creek.

32. **Labidesthes sicculus** Cope.

Not abundant.

33. **Aphredoderus sayanus** Gilliams.

Five specimens of this species were taken on muddy bottom in Salt Creek, where it is probably locally abundant. In a specimen 3 inches long the vent is separated from the "knob" at the throat by a distance equal to diameter of orbit. In other specimens, 4 inches long, the vent is immediately behind the "knob."

34. **Pomoxys annularis** Raf.

Rather common in Salt Creek.

35. **Ambloplites rupestris** Raf.

Abundant.

36. **Lepomis cyanellus** Raf.

Found abundant in smaller creeks.

37. **Lepomis megalotis** Raf.

The most abundant sunfish, ascending all the small tributaries.

38. **Micropterus salmoides** Lac.

39. **Ammocrypta pellucida** Baird.

Abundant on sandy shoals of White River. Not yet observed in the smaller tributaries.

40. **Boleosoma maculatum** Agassiz.

Everywhere very abundant. In all specimens examined from these waters the cheeks and breast are wholly naked.

41. **Diplesion blennioides** Raf.

Very common in White River and its larger tributaries.

42. **Percina caprodes** Raf.

Found in great numbers in Salt Creek. The nape is uniformly closely scaled in the many specimens examined.

43. Hadropterus phoxocephalus Nelson.

This beautiful species was found very abundant in White River. A single specimen was also taken in Salt Creek.

44. Hadropterus aspro Cope & Jordan.

Common in all larger streams.

45. Serraria* sciera Swain.

The types of this species were taken in Bean Blossom Creek, a tributary of the West Fork of White River. A single specimen from Salt Creek, Brown County, Indiana, varies somewhat from the original in the following respects: Maxillary reaching vertical from eye, which equals length of snout. Preopercle with very well-marked denticulations, the teeth short but sharp. Snout 4½ in head. Space between dorsals much less than length of snout. Longest dorsal spine ½ head. Median line of belly with a distinct series of small spinous plates, beginning slightly in advance of vent, and not continuing quite to base of ventrals, the space on median line in front of this series naked. There seems to be no reason for doubting that these plates are deciduous. Entire region in front of pectoral fins covered with embedded scales, of which the median series alone is conspicuous; a small triangular area behind isthmus naked. Color much paler than in types; dusky olive, with about 8 vague dusky cross-blotches along middle of sides. Anal and soft dorsal dusky, with a translucent streak above their middle; spinous dorsal with some dusky blotching. Caudal obscurely barred. An enlarged, dark-edged humeral scale.

46. Etheostoma flabellare Raf.

Common in smaller tributaries.

47. Pœcilichthys cæruleus Storer.

Very abundant, especially frequenting rapids of small clear streams, where the finest specimens are always found.

INDIANA UNIVERSITY, *June* 10, 1884.

**Serraria*, gen. nov. (type *Hadropterus sciera* Swain). This form seems worthy of generic separation from *Hadropterus*, with which it agrees in other respects, because of the wide union of the branchiostegal membranes across the isthmus, and especially the well-developed serration of the preopercle, which last character is not known to occur elsewhere among the *Etheostomatinæ*. The teeth are sharp and close set, and are developed on both vertical and horizontal limbs of the preopercle.

NOTES ON THE FISHES OF SWITZ CITY SWAMP, GREENE COUNTY, INDIANA.

By CHAS. H. GILBERT.

A short distance south of Switz City, Greene County, Indiana, is a low-lying treeless "prairie," of circular outline, and from two to four miles in diameter. During the winter and spring this tract is overflowed to a considerable depth, and in seasons of unusually high water it has free communication with the West Fork of White River, which flows near it. When visited by the writer during the last week of August, 1883, water covered most of the swamp to a depth of less than a foot, most of the fishes having been obliged to retire to a narrow, ditch-like depression near its middle. Here they were gathered in such numbers that the farmer lads of the vicinity were catching fine strings of black bass and sunfish, and still larger strings of "pond-fish" (*Amia*) by thrusting a pitch-fork rapidly and at random through the muddy water.

The species enumerated below may serve as some indication of the fauna characterizing the numerous swamps and bayous of Southwestern Indiana. Of the fourteen species obtained, one is thought to be new, and five are here for the first time recorded as occurring abundantly in Indiana.

1. Amia calva Linn.

Found in great numbers in this and all other swamps and bayous along the lower course of White River. This fish has the reputation of being totally unfit for food, but I was assured by the boys who were taking them home that, although not very good, they were still good enough to eat. I also saw a string of them sold for a good price to a (perhaps unsophisticated) inhabitant of Switz City. The species is universally known in Greene County as the "Pond-Fish."

2. Amiurus melas Raf.

3. Amiurus nebulosus marmoratus Holbrook.

Numerous specimens from 5 to 10 inches long, all showing very conspicuously the characteristic coloration of this form.

Head dusky; sides of body, and all the fins, sharply mottled with silvery-white, greenish, and dusky.

Head $3\frac{1}{3}$ in length; depth $3\frac{2}{3}$. A. 22.

Body deep, closely compressed, the back much elevated; profile rising rapidly in a straight line from snout to base of dorsal spine. Head not broad, comparatively little depressed, narrowing rapidly forwards, the snout sharp and conical. Mouth narrow, the two jaws equal, the distance between the bases of the maxillaries equaling about $\frac{1}{3}$ length of head. Maxillary barbel reaching end of basal fourth of pectoral spine.

Eye large, $4\frac{1}{2}$ in interorbital width, which is slightly more than half length of head. Front of dorsal about equidistant between tip of snout and front of adipose fin, the spine less than half length of head by diameter of pupil. Pectoral spine slightly more than half length of head. Base of anal $\frac{1}{4}$ length of body. This specimen (10 inches long) seems to differ from those previously described in its shorter spines.

The significance of the marmorations of this form is not yet certainly known, and no other characters have been pointed out separating it from *nebulosus*, which is itself often obscurely mottled. Until more light is thrown upon the question, we may distinguish the sharply marmorated form as a subspecies. The *marmoratus* has been recorded by Professor Forbes from Southern Illinois, but has not before been reported from Indiana.

4. Ictiobus bubalus Raf.

Several specimens of this species were seen, none of them adult. An example, one foot long, shows the following characters:

Dusky brownish above and on sides, light below. Fins blackish.

Head $3\frac{3}{4}$ in length; depth $2\frac{4}{5}$. D. I, 25; A. II, 9. Lat. l. $38\frac{8}{6}$.

Back strongly carinate from occiput to front of dorsal, the anterior profile well arched, much more so than ventral outline.

Upper lip very thin, finely and evenly plicate; lower lip thicker, also plicate, the folds much broken into papillæ. Mandible very obliquely set, its length about equaling snout, $3\frac{1}{2}$ in head. Opercle wide, $2\frac{1}{3}$ in head, with strong striæ radiating from its upper anterior angle. Eye small, 6 in head, its center at the end of first $\frac{1}{3}$ of head. Interorbital width $1\frac{6}{7}$ in head.

Front of dorsal about midway of body, falling slightly in advance of base of ventrals; anterior rays elevated, about $\frac{1}{2}$ length of base of fin, $1\frac{2}{7}$ in head. Last dorsal ray over middle of anal, the first rays of which reach base of caudal. Pectorals not reaching ventrals, $1\frac{2}{7}$ in head; ventrals equaling pectorals, not nearly reaching vent.

5. Erimyzon sucetta Lac.

Not very abundant.

6. Notropis heterodon Cope.

The specimens on which the following description is based are referred with doubt to the *Hemitremia heterodon* of Cope. The characters shown by them are very different from those assigned to *heterodon*, inasmuch as the lateral line is complete, the teeth 2–4–4–2, and the snout sharp, with a terminal mouth. A large amount of material in the Illinois Laboratory of Natural History, taken from the streams of Illinois, shows such a complete gradation between the two forms, however, that I do not venture at present to assign specific rank to that represented by my specimens.

Body slender, compressed, the back little elevated, rising from snout to front of dorsal. Head small; snout short and rather sharp, slightly

decurved. Mouth terminal, small, oblique, the maxillary barely reaching vertical from front to orbit, equaling length of snout, which is 4 in head. Eye large, very slightly longer than interorbital width, 3 in head. Teeth (in the three specimens examined) uniformly 2–4–4–2, with strong groove-like grinding surface, the sharp edges of the grooves finely denticulated on three of the teeth.

Ventrals inserted under second or third ray of dorsal, the origin of which is constantly slightly nearer snout than base of middle caudal rays. Longest dorsal ray about $\frac{4}{5}$ length of head, twice the length of the base of the fin, and three times the length of the last ray. Caudal longer than head. Pectorals not nearly reaching ventrals, the latter about to vent.

Scales not crowded, the exposed surface little higher than long, 13 in front of dorsal fin. Lateral line, complete, very little decurved anteriorly where it runs along the lower edge of the dark lateral stripe.

Head 4 in length; depth, $4\frac{2}{3}$; D. 8; A. 7; L. lat., 37.

Head dusky above; back with outlines of scales rendered conspicuous with dusky specks; a faint dark vertebral line, usually double in front of dorsal, single behind. Sides and below light, with some silvery luster, but the sides without distinct silvery streak; a dusky streak along middle of sides ends in a black spot at base of caudal, and extends anteriorly across opercles and around snout. This streak is composed of minute black dots, some of which are clustered around the pores of the lateral line rendering these very conspicuous. A series of specks along base of anal, continued as a double series along lower edge of caudal peduncle to tail. Fins unmarked.

Three specimens, each about two inches long.

7. Notemigonus chrysoleucus Mitch.

Abundant.

Maxillary equaling diameter of eye, 4 in head. A. 13. Lateral line 50.

8. Zygonectes dispar Agassiz.

Found occurring in myriads everywhere in the shallow waters of the swamp. The differences in coloration of males and females were sharply marked. The largest specimens seen were about two inches long. There is a small dark blotch in front of upper rim of orbit, not extending much beyond nostrils; the dark blotch below eye is very conspicuous, and covers nearly all of cheek.

This species had previously been taken in Central and Southern Illinois, and in Northern Indiana.

9. Esox vermiculatus Le Sueur.

Very abundant. Coming from the swamp, these specimens are very dark, the dark markings on back and upper part of sides confluent, these regions uniform greenish black. A narrow black streak backward from eye, as well as that leading forward, and the conspicuous

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vertical bar. Anterior dorsal rays reddish. D. IV, 12 or 13. B. 11, 12 or 13.

10. **Pomoxys sparoides** Lac.

Not abundant.

11. **Chænobryttus gulosus** C. & V.

Taken in great numbers; the most abundant sunfish in the swamp. Males marked with bright coppery-red on sides, the females light greenish-yellow. This species occurs, but not abundantly, in Northern Indiana and Illinois, and is very common in Southern Illinois.

12. **Lepomis pallidus** Mitch.

Abundant.

13. **Micropterus salmoides** Lac.

Abundant.

14. **Pœcilichthys palustris**, sp. nov.

Allied to *Pœcilichthys eos*, Jordan & Copeland.

Color in life, olivaceous, much mottled with brownish; 11 or 12 cross-blotches of bright green on back, and an equal number on middle of sides the two series separated by a light streak along lateral line; belly dusky. Cheeks dusky greenish, with a black blotch below eye. Membrane of spinous dorsal mostly black on basal half; above this a translucent streak, then a yellowish-red series of spots. Second dorsal and caudal marked with dusky. In spirits the green blotches on sides appear blackish.

Head $3\frac{1}{2}$ or $3\frac{3}{5}$ in length; depth 6; D. IX or X — 10; A. II, 6; Lat. l., 50 to 52 (20 or 21 pores).

Body very slender, terete, little compressed; caudal peduncle especially long and slender, its length behind anal three times its depth. Head but little compressed, nearly as wide as high; snout short and rather blunt, not at all overhanging the small oblique mouth; premaxillaries on a level with lower edge of pupil; maxillary reaching beyond front of orbit, $3\frac{3}{4}$ in head. Premaxillaries not protractile. Breast, snout, and top of head naked, cheeks and opercles closely scaled. Eye very large, $3\frac{1}{3}$ in head; snout $5\frac{1}{2}$ in head, the interorbital width less than length of snout, concave.

Dorsals well separated, short, the distance from origin of spinous dorsal to end of soft dorsal equaling one-third total length; highes, dorsal spine $2\frac{1}{3}$ in head. Caudal rounded, $1\frac{2}{3}$ in head; length of caudal peduncle $3\frac{1}{4}$ in body. Anal spines very small, the second smaller than the first, (in one specimen obscure.)

Scales very strongly ctenoid, present everywhere except on top of head, snout, breast, and a very narrow streak in front of dorsal. Lateral line with a rather weak arch anteriorly, the pores continuing on 20 or 21 scales, discontinued about under base of last dorsal spine.

Two specimens (probably males) were picked out of the mud in the bag of the seine.

INDIANA UNIVERSITY, *May* 10, 1884.

REMARKS ON THE SPECIES OF THE GENUS CEPPHUS.

By LEONHARD STEJNEGER.

The following papers were originally prepared for publication separately. When the last one was finished they were found to constitute a kind of monograph of the genus *Cepphus*, and it was therefore thought more useful to have them published together under one heading. The occasional repetitions are thus accounted for.

For the sake of completeness, the synonymy of the generic name is here added.

Cepphus PALLAS.

< 1758.—*Alca* LIN., Syst. Nat., 10 ed., I, p. 130.
< 1760.—*Uria* BRISS., Orn. VI, p. 70.
< 1766.—*Colymbus* LIN., Syst. Nat., 12 ed., I, p. 220.
< 1769.—*Cepphus* PALL., Spic. Zool., V, p. 33 (type *C. lacteolus*).
= 1819.—*Grylle* LEACH, in Ross's Voy. Discov. N. W. Pass., App., p. LI (type *G. scapularis* LEACH).

I.—CEPPHUS MOTZFELDI (BENICKEN).

I wish to call the attention of ornithologists, and especially those in North America, to the fact that, in all probability, a black-winged Guillemot occurs in the North Atlantic, having mostly been overlooked or regarded as a melanotic phase of the Common Guillemot since its first discovery sixty years ago. It would be exceedingly interesting to ascertain the status of the alleged species, a question of special concern to American ornithologists since the type was received from Greenland.

The information at hand is very scanty and the sources of rather difficult access to many ornithologists; even Prof. A. Newton failed in finding one of the original descriptions. I therefore intend to give in the following a complete extract of all that has been written about the matter, as far as it is known and accessible to me, believing that such a bringing together of all the material may facilitate the work of future investigators, and hoping that it may stimulate to further research when it is seen how little is known about a bird inhabiting the seas between North America and Europe.

In a paper entitled "Beyträge zur nordischen Ornithologie" (=Contributions to Northern Ornithology) and published in the August num-

ber of Oken's Isis, 1824 (pp. 877–891), Mr. Benicken described a new Guillemot in the following words):

[p. 888] *Uria.*

"Although convinced that great discretion is to be exercised in establishing new species, particularly among the northern water birds, in which the different species of each genus are so very much alike in regard to coloration, while even the different individuals of the same species, according to circumstances, vary greatly in size and shape of bill, etc., I am inclined to think that, besides the known species of Uria, still a new one occurs in the polar seas, which, although on the whole resembling the allied forms, differs distinctly from every one of them. The length of the bird is 16 inches 9 lines, Hamburg measure [=400 mm *]. Bill black, much compressed, with very prominent edges of the upper mandible, a strongly-marked gonydeal protuberance, bent tip, and feathered as far as above the nostrils.

"Length of bill from forehead	1 inch,	9 lines	H. m.	[42mm]
— — from angle of mouth	2 —	3 —	— —	[54mm]
— — from nostrils	1 —		— —	[24mm]
Length of head, from nape to forehead	2 —		— —	[48mm]
Length of head including the bill	3 —	9 —	— —	[90mm]

"Tarsus 1 inch 6 lines [36 mm], yellowish brown. The webs whitish. The entire plumage sooty black, on the abdomen shading somewhat into grayish; wingfeathers brownish black.

"From this description it is plain that the bird in question is distinguished from *U. grylle* by being of larger size, from *U. troile* and *Brünnichii* by having a differently shaped bill. The latter is much shorter and more compressed than in *U. troile*, in shape resembling more that of *U. Brünnichii*, but is shorter and only one-third as broad.

"I am unable to say more about this bird, as I only received one single skin in 1820. Mr. Faber, who in Iceland had ample opportunities for studying the known Guillemots, declares it to be a new species. Should other ornithologists agree herein and allow me, as the first describer of the species, to apply a name to it [p. 889)] I should wish to have it named *Uria Motzfeldi*, after a friend of mine to whom I am indebted for many a northern curiosity."

In the following, the September, number of the same journal, Faber, in the third part of his excellent "Beyträge zur arctischen Zoologie" (Contributions to Arctic Zoology), treating monographically of the genus *Uria* (=*Cepphus* + *Uria*), on page 981, describes the same specimen as new under the name of

[p. 981] "7. *Uria unicolor.*

"By this name I wish to call theattention of ornithologists to a very rare Guillemot found in the northern bird-rookeries. I will here present my data, leaving it to later experience to decide whether it is a new species or not. The owner of the bird-rookery on Drangöe [Iceland],

* One inch Hamburg measure = 0.0239m.

who knew very well the birds breeding on the rookery, told me, as a great curiosity, that sometimes a pair of black-birds (*uria troile*) were breeding on the rocks, which were reddish-brown all over; they were described to me as being as large as the young *alca torda*, but of the habits of *uria Brünnichii*. This was rather remarkable. I did not pay much attention to it, however, before last fall, when, in the collection of Mr. Secretary Benicken, in Sleswick, I was struck at the sight of an *uria* which he had received from Greenland, and which agreed closely with those described above. It was uniform reddish-brown all over the body, with darker bill and feet, and of the size of a young *alca torda*. The bill, differing from that of all known Guillemots, had shape and size intermediate between that of *uria Brünnichii* and *uria grylle*. It sometimes happens that albinistic varieties are found among the northern birds; thus I know of white varieties of *uria grylle*, *uria alle carbo graculus*, *anas histrionica*, but I never happened to observe the pure white color varying into the darker, as would here be the case, as the *uria* presently named can by no means be regarded as a variety of any other species than *uria Brünnichii*, which always has the breast and belly white. The bill and the whole body, however, are too small for an old *uria Brünnichii*; but this uniformly colored *uria* must be old, as it is said to have bred on the rookery at Drangöe. It may [p. 982] also be remarked that Fabricius (in the *faun. Groenl. p.* 81, *No.* 3) mentions an *uria dorso rubro*, for the rest similar to *uria Brünnichii*, and Ström, in his description of Sundmör (*I, p.* 219), speaks of an *alca pectore rubro*."

This is the original description of *Uria unicolor*. It will be seen that *U. motzfeldi* has the priority over Faber's name by one month, consequently the one to be adopted if the bird should turn out to be distinct.

The next time the bird is mentioned is in the same journal for 1826, where Brehm (on p. 988) speaks of "*Uria unicolor Benicken*" as being "blackish-brown," but too little known to him to be assigned its precise position.

Brehm, therefore, is the originator of the "*Uria unicolor* BENICKEN," a quotation afterwards to be found in most cases when the bird has been mentioned.

We have seen that Faber in 1824, in describing *Uria unicolor*, regarded it as mostly allied to *U. brünnichii*. He seems afterwards to have changed his opinion, however, for in the continuation of his elaborate monograph (Beyträge zur arctischen Zoologie, VIII, Isis, 1827, p. 639) he speaks only of "Variat. extraord. avis tota alba vel *tota nigra*," under the heading of *Uria grylle*. *U. unicolor* is not mentioned at all, but it is almost certain that this "variatio extraordinaria" "tota nigra" of *grylle* is the same thing.

Brehm, in his "Handbuch der Naturgeschichte aller Vögel Deutschlands" (1831, p. 985), does not add anything to what he said in the Isis for 1826.

The next time we find any allusion to this totally black "Tyste" is by Bonaparte, who, in his "Catalogo Metodico degli Uccelli Europei" (Bologna, 1842, p. 82), introduces as European No. 532, *Grylle carbo*, BRANDT, the habitat of which is given as "*Bor. Eur.* or. As." It seems hardly doubtful that it is Faber's Icelandic bird which is meant.

Two years later Herman Schlegel mentions our bird (Revue Critique des Oiseaux d'Europe, 1844, p. 106) in the following words:

"Uria unicolor *Faber* (*Isis*, 1824, p. 981), from Iceland, seems to me to be an accidental variety of *Uria grylle*. We have received a similar specimen from Greenland."

In the same year Naumann (Naturgeschichte der Vögel Deutschlands, XII, 1844, p. 485) mentions only in passing "*Uria unicolor* (Benicken)" as an Arctic species, uniformly dark reddish brown all over the body, but like Faber at first, and Brehm afterwards, he refers it to the restricted genus *Uria*, and not to *Cepphus* (=*Grylle*).

Subsequent writers have mostly referred Faber's bird as an individual variety either to *grylle*, *troile*, or *brünnichii*. As their conclusions are based solely on what has been quoted above, no further remarks upon them is necessary. It may only be added that Bonaparte, in 1856, in his Catalogue Parzudaki, enumerates *U. unicolor* as doubtfully European.

Nothing more became known about this puzzling bird until Prof. A. Newton, in his well-known "Notes on the Birds of Spitzbergen" (Ibis, 1865, p. 518), mentioned *another specimen*, said to have come from Iceland. He says:

"In *Cepphus carbo* again, and in *what is perhaps another species*, the white spot [on the wing] entirely disappears," and in a foot-note he adds: "I refer to a *specimen in the British Museum*, marked '*Uria carbo*,' but which wants the white eye-patch of that species, and is entirely black all over. This specimen was bought of Mr. Argent, and said to come from Iceland, which is just possible, since Faber speaks of an entirely black variety of *Uria grylle* from that locality (Isis, 1827, p. 639). What, and when described, is *Uria unicolor*, Benicken"? I cannot trace it back beyond a note of Brehm's (Isis, 1826, p. 988). Under the name of *Uria motzfeldi* Benicken described a Guillemot entirely black, but differing from *U. grylle* by being much larger (Isis, 1824, pp. 888, 889). The British Museum bird is much the same size as that species."

After this we have to record Schlegel's account of a specimen in Leiden, mentioned in his "Muséum d'Histoire Naturelle des Pays-Bas" No. 33, Livr. 9, Urinatores, Avril 1867, p. 20, where, as No. 27, under *Alca grylle*, is enumerated a specimen, of which he says: "Specimen with the plumage of an absolutely uniform smoky black, from Greenland, obtained in 1859; *one of the types* of Faber's *Uria unicolor*."

Schlegel's last account is very puzzling, as Faber had only one type, that being Benicken's specimen from Greenland, the very same one upon which the latter had already based his *U. motzfeldi*. On the other

hand, is this specimen not the one mentioned by him as received in Leiden as early as 1844, and is not 1859 only a misprint for 1839? Or had Schlegel actually two similar specimens before him?

I cannot now lay hands on Holböll's papers, but I find in Professor Newton's "Notes on Birds which have been found in Greenland" (Arctic Manual, p. 109, 1875), that "Holböll says he has seen in Greenland an entirely black example."

So far as I know, none of the later expeditions into the Arctic mentions having met with these totally black birds except Mr. L. Kumlien, the naturalist of the "Howgate Polar Expedition, 1877–'78," on the schooner "Florence," who saw three specimens, of which one was secured. He writes as follows (Contributions to the Natural History of Arctic America.=Bull. U. S. National Museum, No. 15, p. 105): "I have seen three entirely black specimens, which I considered to be *U. carbo*. One was procured in Cumberland, but was lost, with many others, after we arrived in the United States. I have examined specimens of *carbo* since, in the Smithsonian collection, and my bird was nothing but a melanistic specimen of *U. grylle*." It may be remarked, however, that in the Smithsonian Institution or more correctly the National Museum is, and has been, only a head of *C. carbo*, and that Mr. Kumlien's conclusion that his bird was only a melanistic stage of *grylle* was not based upon actual comparison. The finer differences in structure and color may easily have escaped his attention or his memory.

When looking over the references collected together above, one can hardly escape the impression, that they all refer to a really valid species and no individual variation, no melanism.

To begin with, there are known to exist, in collections, two specimens at least—one in Leiden, the other in the British Museum—which, judging from the descriptions, must be alike, and, on the authority of Schlegel and Newton, most nearly related to *C. grylle* (or, perhaps, rather *C. carbo*).

Assuming now that Schlegel's specimen, described by him as "d'un noir velouté absolument uniforme," is the very same as that upon which *U. motzfeldi* was based, we will be justified in concluding that Faber's designation of its color, "reddish brown," was incorrect and probably only taken down from memory. Furthermore, it can hardly fail that the bill differs as much from that of the *grylle* as does the color of the plumage. Benicken's and Faber's descriptions are too distinct to admit of doubt on this point. Schlegel, it is true, does not mention any difference in the shape of the bill, but including, as he did, *C. columba* under *grylle*, it is evident that he allowed a much greater individual variation than is permissible. Nor does Newton say anything about the bill of the British Museum specimen, but the fact that it was labeled "*Uria carbo*" might perhaps indicate that the bill is shaped somewhat as in the latter species.

As to the size, Professor Newton remarks that the British Museum

specimen is of about the same size as *grylle*. Benicken and Faber expressly say that their type was larger, but as no measurements of wing and tail are given, we have no means of verifying their statements, which may possibly be due to overstuffing of the specimen. The only measurements of which we can make use are those of the bill and tarsus as given by Benicken.

To facilitate the comparison, the measurements are combined into a synoptical table, including Benicken's measurements as given above, the average dimensions of 7 old *C. grylle* in the black summer-plumage, and the dimensions of the bill of a head of *C. carbo*, from Japan (U. S. Nat. Mus., No. 21270).

Comparative table of measurements.

Species.	Specimens.	Exposed culmen.	Commissure.	Bill from tip to fore border of—		Tarsus.
				Nostrils.	Nasal groove.	
		mm.	*mm.*	*mm.*	*mm.*	*mm.*
C. motzfeldi	Benicken's specimen	42	54	*24		36
C. carbo	U. S. National Museum No. 21270	43	56	32	27	(†)
C. grylle	Average of 6 adults in National Museum	31	46	24	19	32

* Benicken says: "Length of bill from the nostrils" (Länge des Schnabels von den Nasenlöch.), but as 24mm is disproportionate to the other dimensions of the bill, as given by him, I suppose that he measured from the anterior border of the nasal groove; or "1 inch" may perhaps be a misprint.

† v. Schrenck's measurements of the tarsus of three individuals of this species amounts to 35mm (Reis. Amurl. I, p. 497: 1″.4½‴).

It seems apparent from the table, that Benicken's specimen cannot have been merely an individual color variety of *C. grylle*, as the differences in the size of the bill and tarsus are too great and far beyond the limits of individual variation of the latter species. On the other hand, the agreement with *C. carbo* in regard to size is very striking, and if the British Museum specimen agrees with Benicken's type in this point, its reference to *C. carbo* is easily explained. It is true that Professor Newton does not mention this, but it seems as if he had not the specimen before him when writing his Notes on the Birds of Spitzbergen, or he would hardly have failed to give a more explicit description of the bird in question.

To regard Benicken's bird as a melanistic stage is hardly defensible in the view of his description of the color: "entire plumage sooty black, *on the abdomen shading somewhat into grayish.*" We have already remarked that Faber's description of the color as "reddish brown" is not to be relied upon: but it can hardly fail that the plumage had a brownish hue, or this careful observer would not have made so egregious a mistake. It also argues greatly against the probability of melanism as the true explanation that so many individuals have been observed: two are in museums, three were seen—one of which was collected—by Kumlien, one observed by Holböll, not to speak of those mentioned by Faber as breeding at Drangö. It is very suggestive that all these are reported from Greenland and Iceland, and none from Europe or Spitzbergen.

I am strongly inclined to the belief that there are two black-winged Guillemots, one *U. carbo*, from the western part of the North Pacific Ocean, the other from the western part of the North Atlantic, *U. motzfeldi*, the difference of which are that the former has a white patch round the eyes, while in the latter the head seems to be uniformly dark colored without any distinct pattern.

It has been suggested that these whole-colored Black Guillemots observed and obtained in the Northwest Atlantic really might have been true *U. carbo*, stragglers from the Pacific, and instances of North Pacific birds accidentally caught in the Atlantic have been quoted in this connection, for instance *Lunda cirrhata* in Greenland and *Cyclorhynchus psittaculus* in Sweden. It may be remarked that these two species are of general distribution in the North Pacific, while *U. carbo* is confined to the Okotsk and Japanese seas. It speaks furthermore against this theory, that so many examples have been observed, and that we have, indirectly at least, the testimonies of Schlegel and Newton, that the two specimens known are not referable to *U. carbo*.

The question whether we have to deal with a distinct species or not is an exceedingly important one, and anybody having the opportunity of examining the specimens in Leiden and London would earn the thanks of his fellow ornithologists by publishing a *detailed* description and comparison. It is hoped that if anybody does so he will give the particulars of his investigation so explicitly that others may be enabled to form an independent opinion upon them, and that we will not have to content ourselves with the results which he thinks he has obtained, as is the usual way of many ornithologists.

In the meantime, the attention of such ornithologists should be directed to the same question, who have the opportunity of investigating or promoting investigation of the North Atlantic waters. Everything seems to indicate that such a bird may be found somewhere in the neighborhood of Greenland, and may be considered as well entitled to a place in the North American faunal lists as many other species. It is now for American ornithologists to prove that it really exists and that it really belongs to our avi-fauna.

II.—On the White-winged Species of the Genus Cepphus.

Cepphus mandtii was first obtained and described from the sea between Spitzbergen and Greenland, and was subsequently found in both of these islands, from which, also, the original *C. grylle* was reported simultaneously as an inhabitant.

In Europe Mandt's Tyste has been generally recognized, by some as a geographical race only, Schlegel, Sundevall, &c., designated by a trinominal appellation, while other authors, and especially Prof. A. Newton, maintained its right to rank as a distinct species.

North American ornithologists, however, up to the present date, have ignored the form altogether, although it has been positively stated to

breed in Greenland. Cassin in Baird's "Birds of North America" (1858) placed it with query as a synonym of *C. columba*, and Dr. Coues, most unfortunately, followed him (partly) when publishing his "Monograph of the Alcidæ" (Pr. Philada. Acad. 1868), in spite of Professor Newton's excellent indication of the species three years previous (Ibis, 1865). Since that time American Ornithologists have been silent about it.

This seems rather singular, but is now easily explained, as, by going over the ample material, I find that in most cases the American Ornithologists had only had the true *C. mandtii* before them, and that they have hardly been acquainted with the true *C. grylle*, which it seems is rather of restricted distribution in North America. They have mistaken the common American bird for *C. grylle* for want of sufficient material for comparison, being under the impression that the latter should be the common form, while *mandtii* was generally regarded as an inhabitant of the most icy and Arctic regions. Material which has accumulated only very recently has led me to this conclusion, and also convinced me, that *mandtii* is a perfectly good species, rather easy to distinguish and describe. I am thus able to fully corroborate Professor Newtown's views, alluded to above. As even the history of *C. columba* has been involved in some doubts—Schlegel placed it with *grylle* as a synonym—it may be expedient to treat of this species also in the present connection.

Before beginning a detailed comparison of the three species of Tyste, with white wing-patches, a few general remarks may not be out of place.

A certain distinction between the young and the adults of these three species is the presence or absence of dusky *at the tip* of the feathers forming the white wing-patch or speculum. It is not fully established whether these dusky ends disappear as early as at the first moult of the wing feathers following the breeding season next after that in which the bird was born, or, in other words, when one year old, or whether they first are lost in the second year, so that the bird would not breed before nearly three years of age; for I do not think that the Tyste breeds in the plumage with the spotted speculum, at least I never saw one. To me it seems most probable that the wing-coverts become white as early as the first moult, that is, when fully one year old, and that they breed in the second season following that in which they were born.

In the history of these species the immature birds with the dusky spotted speculum have caused great confusion. Not that the young of the three species are indistinguishable in this plumage, but as the characters are not so pronounced in the immature as in the adult—as usually among birds—their taking into account when comparing the the species will necessarily obscure the result. If Dr. Finsch had not mixed old and young ones indiscriminately together in his detailed account of the specific difference of *grylle* and *mandtii*, he most probably would have reached a result contrary to that he arrived at (2te Deutsche

Nordpol-Fahrt, II, p. 221 *seqr*). It is therefore absolutely necessary that the comparison should be made between *fully mature birds, in the black plumage, and without dusky tips to the wing-coverts.* If an investigation based upon such material shows trenchant and constant characters, then we have all that is needed to establish good and undoubted species.

As all winter specimens in the light and mottled plumage and all immature birds with mottled wing-speculum are to be rejected, a large material, of course, is needed. I have had unusual facilities in that respect, and I doubt that any ornithologist has ever had 78 good specimens, besides downy young of these three forms, as I have now before me. In this vast series are birds from almost all quarters where these species occur: Atlantic and Baltic coasts of Scandinavia, Spitzbergen, Orkneys, Iceland, Greenland, Cumberland Sound, Hudson's Bay, northeastern coast of North America, Point Barrow, Herald Island, northeastern corner of Asia, Alaska, Kamtschatka, Aleutian Islands, and west coast of North America as far down as San Francisco and San Miguel in California. Of these 78 specimens some 30 are adults in the plumage indicated above. All of these have been examined, but only the measurements of 25 have been given below, as the mounted specimens have not been measured in order to secure perfect uniformity of the measurements. I trust that all necessary precautions to obtain conclusive results have thus been taken. In the following, consequently, is only meant specimens *in totally black* (not even partially mottled) *plumage with no dusky tips on the white upper wing-coverts*, unless otherwise stated.

There is one character which in all ages and plumages is sufficient at the first glance to distinguish *C. columba* from the two other species, viz, the color of the under wing-coverts, these being always more or less brownish gray or smoky in *C. columba* and pure white in *C. grylle* and *mandtii*. This character is "unfailing," and not only distinguishes the adult birds, for I have young before me still partially in the down, in which it is as fully diagnostic as in adults in full breeding plumage or in the light winter garb, and in all the 78 birds no one exception or intergradation. To this mark may be added several others, as will be seen from the tables of dimensions, as given below; *columba* is altogether the larger bird, the toes besides being disproportionately longer than in the other species, the bill stouter, etc. As a rule *C. columba* has 14 tail-feathers, while the other two have only 12, a very remarkable feature, though one which is not always to be relied upon, as individuals of *grylle** occasionally are found with 14 and of *columba* with 12 rectrices. The unconditional reliance upon this character caused v. Heuglin to identify a bird with 14 tail-feathers from Spitsbergen as *C. columba*, a mistake he never would have made had he looked at the color of the under wing-coverts. A further difference is

* Brehm seems to have had specimen of *mandtii* with 14 rectrices. Cf. Naumannia 1855, p. 300.

found in the black cross-bar of the wing-speculum, a peculiarity to be discussed more in detail further on, when speaking of *C. grylle*.

Finally a character should be mentioned which may seem trifling, but nevertheless is very constant. In *grylle* and *mandtii* the black has a faint but decided greenish gloss, which in *columba* is substituted by a less glossy slate-colored wash on the back, with indication of purplish on the abdomen. In old museum specimens of *columba* the tinge is rather brownish, but the absence of green is always well marked.

No one who ever had the opportunity of comparing authentic specimens of *C. columba* can doubt its absolute validity as a species.

It has already been pointed out by Prof. A. Newton, and I am in the position of being able to indorse his statement most emphatically, that "there exists an unfailing means of differentiating *Cepphus mandtii* from *C. grylle*. This lies in the feathers which form the conspicuous wing-spot. In the more northern form from Greenland and Spitsbergen they are pure white at the base, even in immature birds, while in the true *C. grylle*, from our own islands, Iceland and Norway, with its stouter bill, these feathers are always black at the base, forming an entirely, or almost entirely, concealed band across the wing-spot." It may be added, however, in order to avoid mistakes, that not all "the feathers which form the wing-spot" are meant, but only the large coverts of the secondaries, the so-called "greater upper wing-coverts."

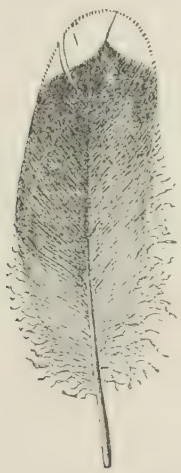

Fig. 1. *Cepphus columba*, ad.

Fig. 2. *Cepphus grylle*, ad.

Fig. 3. *Cepphus mandtii*, ad.

The large series before me is easily divided into two groups. In the one the greater wing-coverts are white to the very base, with or without an indistinct dusky line along the basal half of the shaft (fig. 3); all birds thus colored have a slenderer bill. In the other group the greater wing-coverts are black or blackish for about their basal half or more, with a sharp outline towards the white of the terminal half (fig. 2): all birds thus marked have the bill stout and strong. The former belong to *C. mandtii* proper, the latter to the true *C. grylle*. The black bases of the greater wing-coverts in *grylle* form a continuous black cross-bar

over the speculum: just after the moult, when the feathers are entirely fresh, the ends of the middle coverts will usually conceal the black bar—although it mostly shines through—but later in the season the overlying tips are worn away and the cross-bar becomes visible; at all events it can be seen by gently pushing the middle coverts a little aside, as there is no need of lifting them up in order to detect the black bases of the underlying feathers. On the other hand, no abrasion or removing of the middle coverts will ever produce anything like the dark cross-bar in *C. mandtii*.* The stoutness and slenderness of the bill as coincident with the presence or absence of the cross-bar is very marked.

There is no difficulty, then, in telling the old birds apart, as they are distinguishable at a mere superficial glance. Adult birds in winter plumage have also the speculum pure white, that is to say, without blackish or dusky spot and mottlings *at the tip* of the feathers. These are only moulted once a year, and are consequently the same as those of the black summer plumage; the character is therefore just as well marked in the winter garb. In the young birds a little more caution and closer inspection are needed, and, in fact, there is usually more dark color at the base in these than in the adults (Figs. 5, 6), but in all speci-

Fig. 4. *Cepphus columba*, jun. Fig. 5. *Cepphus grylle*, jun. Fig. 6. *Cepphus mandtii*, jun.

mens of the large number before me the characteristics of the two forms are well expressed, not a single reference of a specimen is questionable, and I doubt whether specimens really are found which are not easily attributed to the one or the other species.

The young *mandtii* has the tips of the primary coverts and of the secondaries more or less broadly edged with white, which is said never

*It is only just to mention that the value of this character was not first pointed out by Professor Newton, as he and others have thought, for Brehm, in his original description of *U. glacialis* (1824), mentions it in very explicit words. He says (Lehrb. Eur. Vög., p. 925): "The long upper wing-coverts are white to their very base, and therefore no black cross-bar is produced on the wing of the old bird (one may push the feathers aside ever so much) like that in the two foregoing species" [*Uria grylle* and *Uria arctica* BREHM].

to be the case in *grylle*, a feature of which I am unable to speak with absolute certainty, as I have too few young *grylle* at hand.

There is another character which holds good, provided only the corresponding ages be compared, viz, the extent of the white on the inner web of the primaries. This color ascends from the base like a "wedge" and in the old *grylle* does not reach further, when looked upon from the lower surface of the wing, than to about the end of the longest underwing-coverts, while in *mandtii* it goes 15–25^{mm} beyond these. In the young the white wedge is larger, and consequently reaches beyond the coverts also in *grylle*, but the corresponding age of *mandtii* will be found to have them still larger.

In general coloration the two species do not differ materially, except in the winter plumage, which is considerably whiter in *mandtii* than in true *grylle*. As full winter plumages of adults of the latter is the weak point of my series I refrain from a detailed comparison, but I have, at home in Norway, handled enough specimens of *grylle* to state that a true *grylle* is never found so white at any season as *mandtii* in adult and full winter garb.

It will be seen that *C. mandtii* is distinguished at once from its two nearest allies by a white wing-patch unbroken by any black cross-bar, concealed or not. The latter is a character common to both *grylle* and *columba*, which, however, are readily distinguished by the characters given above. But, as indicated, the pattern of the speculum also differs materially in the two species. In *grylle* (Figs. 2, 5) the white tips of the greater wing-coverts are of about the same size in all the feathers, the black cross-bar consequently being of almost equal breadth in the whole extent. In *columba* (Figs. 1, 4) on the other hand, the white tips decrease towards the edge of the wing, the black bases correspondingly increasing, so that the bar becomes much broader anteriorly, almost assuming the shape of a triangular black wedge.* This is not the only difference, however, for in *columba* almost all the coverts have got black bases, which often are so pronounced as to form a second visible cross-band on the speculum.

To complete the comparison four tables of measurements are here added. The first shows the superior size of *C. columba*, and the disproportionate length of the toes; second and third prove the slenderness of the bill of *mandtii* as compared with *grylle*, and in the fourth the averages are put together to facilitate the comparison.

* In most young specimens the first ones of the greater coverts are entirely black.

I.—*Table of dimensions of* CEPPHUS COLUMBA (Pall.).

[*Old* birds in black summer plumage only.]

U. S. Nat. Mus. No.	Collector.	Collector's No.	Locality.	When collected.	Sex and age.	Wing.*	Tail-feathers.	Exposed culmen.	Height of bill at nostrils.	Tarsus.	Middle toe, with claw.
				1882.		*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
89098	L. Stejneger	1037	Bering Island, Kamtschatka.	May 11	♂ ad.	168	55	30	10	35	50
				1883.							
92940	....do	2017	.....do	May 8	♂ ad.	169	51	29	10	35	46
92941	....do	2016	.....do	May 8	♀ ad.	173	53	31	10	35	49
92942	....do	2018	.....do	May 8	♀ ad.	177	55	32	10	35	46
				1855.							
21271	Stimpson	.....	Seniavine Straits	Aug. —	ad.	171	49	33	10	36	.....
61446	.....	.....	San Miguel, Cal	....	ad.	171	50	35	11	36	48
	Average measurements of 6 adults					171.5	52.2	31.7	10.2	35.3	47.8

* The wing, in this and the following tables, is measured with dividers, the curve not being flattened.

II.—*Table of dimensions of* CEPPHUS GRYLLE (Lin.).

[*Old* birds in black summer plumage only.]

U. S. Nat. Mus. No.	Collector.	Collector's No.	Locality.	When collected.	Sex and age.	Wing.	Tail-feathers.	Exposed culmen.	Height of bill at nostrils.	Tarsus.	Middle toe, with claw.
						mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
62381	.....	1	Eastport, Me	July 1	ad.	166	51	29	9	32	.....
24293	....	.....	Orkney Islands	.....	ad.	153	50	31	10	33	43
95256	Stejneger	370	Stavanger, Norway	1879	ad.	160	51	32	9	32	.....
				1864.							
34122	Mus. Stockh.	.....	Stockholm, Sweden	May 3	♀ ad.	170	58	33	10	34	43
98074	Mus. Bergen.	.....	Bergen, Norway	.....	♂ ad.	150	48	29	10	30	41
				1884.							
98075	....do	.....	.....do	Apr. 20	♂ ad.	154	52	32	10	31	.....
1965	Audubon	.....	?	Spring	ad.	162	53	31	9	32	43
	Average measurements of 7 adults					159.3	51.8	31.0	9.6	32.0	42.5

III.—*Table of dimensions of* CEPPHUS MANDTII (Licht.).

[*Old* birds in black summer plumage only.]

U. S. Nat. Mus. No.	Collector.	Collector's No.	Locality.	When collected.	Sex and age.	Wing.	Tail-feathers.	Exposed culmen.	Height of bill at nostrils.	Tarsus.	Middle toe, with claw.
				1881.		*mm.*	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
86020	Schwenck	.....	Green Harbor, Spitzbergen.	Aug. —	ad.	167	53	30	9	31	42
				1876.							
71006	Mintzer	22	Cumberland Gulf	Aug. 4	ad.	160	50	26	.....	30	41
71010	... do	23	.....do	Aug. 4	ad.	158	50	28	.....	31	42
71004	....do	98	.....do	Aug. 26	ad.	162	52	29	.....	32	41
				1878.							
76318	Kumlien	690	.....do	June 9	ad.	167	49	27	8	30	.....
76323	....do	.....	.....do	June 21	♂ ad.	163	51	28	9	33	43
76309	....do	760	.....do	1878	♀ ad.	158	52	27	8	32	41
				1860.							
20837	Drexler	513	St. George, Hudson's Bay	July 19	♂ ad.	150	47	28	8	34	.....
20840	....do	510	.....do	July —	♀ ad.	158	50	27	8	.....	.....
89369	Haydon	.....	Moose Factory, Hudson's Bay.	.....	ad.	158	48	28	.....	33	42
				1855.							
21269	Stimpson	γ282	Herald Island, A. O	Aug. —	ad.	164	52	30	9	32	.....
	Average measurements of 11 adults					160.5	50.4	28.0	8.4	31.8	41.7

IV.—*Comparative table of dimensions.*

Species.	Specimens.	Wing.	Tail-feathers.	Exposed culmen.	Height of bill at nostrils.	Tarsus.	Middle toe, with claw.
		mm.	*mm.*	*mm.*	*mm.*	*mm.*	*mm.*
C. columba	Average measurements of 6 adults	171.5	52.2	31.7	10.2	35.3	47.8
C. grylle	Average measurements of 7 adults	159.3	51.8	31.0	9.6	32.0	42.5
C. mandtii	Average measurements of 11 adults	160.5	50.4	28.0	8.4	31.8	41.7

By the discovery that the American species is *mandtii*, our ideas as to the

GEOGRAPHICAL DISTRIBUTION

of the three species must be considerably modified. Large areas must be detracted from *C. grylle*, and the range of *mandtii* extended correspondingly.

Cepphus mandtii

is circumpolar in its distribution. It is the form known to inhabit Spitzbergen (Malmgr. Newt. Heugl., U. S. Nat. Mus.) and Novaja Semlja (Heuglin); it has been found breeding in Greenland (Faber, Finsch, U. S. Nat. Mus.), and also—and, as it seems, exclusively—on the opposite side of Davis Strait and Baffin's Bay (Kumlien, Feilden, U. S. Nat. Mus.). It is this species which breeds in abundance on Herald Island, north of Bering's Strait (U. S. Nat. Mus.), and there is not the slightest doubt that it is the same species which was found by Mr. E. W. Nelson on Wrangel Island. Nor is it reasonable to suppose that the Guillemot met with by the "Jeannette" party, breeding on Bennett Island, one of the New Siberian Islands, belonged to another species, and the "few Black Guillemots" found by the naturalists of the "Vega" expedition, on Preobraschenij Island, on the coast of the East Taimyr Peninsula, were in all probability the same. In the old world Mandt's Tyste does not seem to breed outside of the Arctic Seas, while on the American side of the Atlantic its breeding range extends considerably further southwards, being, as it seems, from the proportion of the specimens in the National Museum, the most numerous form in the northeastern coast of North America, although no specimens in breeding plumage are from any locality south of Labrador. The National Museum possesses adult birds in breeding plumage from St. George, Hudson's Bay, collected by Mr. Drexler, and also half-fledged young from the same locality.

During winter many individuals remain at the place of their birth, provided open water be found in the neighborhood, while many go further south The National Museum has winter specimens from St. Michael's and Point Barrow, in Alaska, from Eastern North America, Cumberland Sound, and Iceland. In all probability, a portion of the Spitzbergen birds winter on the coast of Northern Norway, and those

from Novaja Semlja may come down to the Baltic, but nothing definitely is known.

Immature specimens in black plumage, but with mottled speculum, are often found south of the breeding range of the species during summer. Thus, I have seen specimens of that kind collected by Mr. Nelson at Stewart Island, near St. Michael's, Alaska, in the month of June. There is no reliable account, however, of the bird having bred south of Berings Strait.

Cepphus grylle

breeds on the coast of northern and northwestern Europe. It occurs from the White Sea all around the shores of the Scandinavian Peninsula and Finland, and is still found breeding on several of the Danish Islands, including Bornholm, in the Baltic, one of its most southern breeding places in Europe, being less numerous, however, in the lower latitudes than higher north. On the British Islands and Ireland it is confined to the northern parts, and is found on the Hebrides, on St. Kilda, the Shetland Islands, and the Orkneys. Common on the Fær Islands and all round Iceland; "numerous nowhere, but common everywhere," as Faber says. The Tyste is a partial resident in the countries where it breeds, but many retire to somewhat more southerly latitudes during the coldest season. At that time they are found common at the German coasts of the Baltic and the North Sea, the southern parts of Great Britain, and more rarely along the coasts of the Netherlands and Northern France.

In the Western hemisphere its distribution seems to be much more limited. It is known to breed in Greenland (Finsch, U. S. Nat. Mus.), and probably also on several localities along our northeastern coast; but as the authors of local faunas have not distinguished between *mandtii* and the present species, the true *grylle*, and as the Museum possesses only few authentic American specimens in breeding plumage, nothing can be said with certainty about its breeding range on our continent. An old bird in full summer plumage without black mottlings on the speculum is in the collection, from Eastport, Me., July 1, and this is the only certain locality at present known to me. But I think it is safe to assume that this is the more southern form, and that it is not found north of Newfoundland, the species which Bryant found breeding in the Saint Lawrence Bay probably being the one in question. During winter it comes further south, and a specimen from that season is in the Museum, having been shot at Philadelphia.

It is most important that the ornithologists along the coast from New Jersey to Labrador should be on the lookout for these birds in order to have determined, as soon as possible, the exact range of so interesting a breeding bird of the United States.

The species does not at all occur in the Pacific Ocean, and all references from there and the adjacent portions of the Arctic Ocean belong to *columba* and *mandtii*.

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Uria columba

is confined to the Pacific Ocean. Its geographical distribution is very interesting, as it breeds as far south as Southern California, consequently much farther south than the two Atlantic species wander even in winter.

From the coast of California this species extends northward all along the western coast of North America way up into Alaska, and all over the Aleutian Islands. There are no reliable instances known, however, of its having been obtained north of Berings Strait, although the National Museum possesses specimens from Plover Bay and from Seniavine Strait at the Tschutski Peninsula, where it is said to be common (Cassin, Pr. Ac. Phil., 1862, p. 323), but these localities are within Berings Sea.* On the Asiatic side it is well known from the shores of Berings Sea, and I found it myself quite common on the eastern coast of Kamtschatka and on the Commander Islands, from where I have brought home numerous specimens. It is not known from the Okhotsk Sea, although specimens have been taken at the Kurile Islands, but whether breeding there I cannot say, as it is possible that those obtained there were only immature birds. It winters about these islands and about Yezo, the northern island of Japan proper. It will be seen that the species is much more northerly on the Asiatic than on the American side of the Pacific. It seems to be replaced further south on the Asiatic coast by *C. carbo*.

III.—Has Cepphus carbo ever been obtained within the faunal limits of North America?

The original describer of the species, Pallas, in his Zoographia Rosso-Asiatica (II, p. 350), gives the habitat of *Cepphus carbo* in the following words: "Inhabits only the Eastern Ocean, about the Aleutian Islands,

*This is the case, notwithstanding Mr. E. W. Nelson's statement to the contrary in his "Birds of Bering Sea and the Arctic Ocean," p. 117. Of *Uria columba* he says: "This is the most abundant of the small Guillemots throughout the North, from the Aleutian Islands to those of Wrangel and Herald, where we found it breeding abundantly during our visit there in the Corwin. We found it near Cape Serdze Kamen, where it was nesting, and also in great abundance upon Herald Island, where it was perhaps the most abundant bird present, far outnumbering the Murre.....None were observed on the western portion of the New Siberian Islands by Nordenskjöld [true, Nordenskjöld does not mention any Black Guillemot, but he saw the islands only from a long distance off], but the Chukchees reported it to him as wintering at Tapkan, whenever open water was found during that season." Any one taking the trouble of comparing these notes with those under the heading of his *Uria grylle* (= *mandtii*) will soon see that they refer to the same species, which is made the more certain by the reference to Nordenskjöld, who expressly calls his birds *grylle*. Here is another case, where the same species has been placed under two different headings, while the remarks on the true *columba* seem to have been dropped altogether. It may be remarked that Mr. Nelson brought no specimens home from those Arctic localities.

especially in the caves around Unalaschka, wherefrom I have received numerous specimens."

So far as I know, this is the only detailed and definite record of this species inhabiting any locality within the limits of the North American fauna. In view of the experience of later explorers, however, the statement must be regarded as erroneous. It has not been found in Unalaschka, by v. Kittlitz, Dall, Turner, Nelson, nor in fact by any of the many expeditions which have stopped there. The museum of the Academy of Natural Sciences in St. Petereburg never received it from the Russian possessions in America (since Pallas's days, at least), nor is it found from there in the Leiden Museum, or any of the other European or American museums which have received collections from that region. The Russian collector, Wossnessenski, who paid special attention to the water-birds, who collected successfully for many years on the Kuriles, Kamtschatka, the Aleutian Islands, and the coast of northwestern America, and whose discoveries and collections have added so much to our knowledge of the *Alcidæ* of those regions, found this species "only on the Asiatic shores of the Pacific Ocean, *e. e.*, on the shores of the Okhotsk Sea, and near the Kurile Islands" (Brandt, Mél., Biol., VII, 1869, p. 206).

As to Pallas's positive testimony, contrary to these negative evidences, it may remarked that there is no question of an observation made by Pallas himself; nor does he give the name of any trustworthy observer, as is his usual practice. It seems as if the statement has been based upon specimens said to have come from Unalaschka, in which case there has been a mistake made in the locality. Several similar mistakes are found in his Zoographia, among others *Leucosticte arctoa*, from the same locality as *C. carbo*, *Actitis hypoleucos* from Kodiak, *Hæmatopus niger*, from the Kuriles [?], and there is no more reason for including *C. carbo* among North American birds than *Actitis hypoleucos*. It seems as if the localities of a whole collection received at St. Petersburg had become mixed up, probably one of Merck's, who collected in all these places.

As remarked above, Pallas's statement is the only *detailed* and *definite* record of the occurrence of the species within our continent. To my knowledge the only statement besides which is not based upon Pallas's account is to be found in the second edition of Dr. E. Coues's "Key to North American Birds" (1884), where, on p. 815, the habitat of *C. carbo* is given as "N. Pacific, in higher latitudes; *British Columbia* to Japan" (italics mine). A diligent search through the literature has not revealed to me the observation or record of specimen obtained upon which Dr. Coues's statement is founded. I may have overlooked the reference, however, and it is of the greatest importance that Dr. Coues should make public his authority. It may be remarked that the statement is not found in the first edition (1872), nor in the same author's "Monograph of the Alcidæ" (Proc. Acad. Philada., 1868).

The true habitat of *C. carbo* seems to be a very restricted one, being confined to the shores of the Okhotsk Sea and adjacent waters. Specimens in the museum of the Philadelphia Academy are said to be from Kamtschatka, being in all probability from the western or Okhotsk shore. Kamtschatka has its Okhotsk and its Pacific shores, as America its Pacific and Atlantic shores, and the difference between the two shores are proportionally the same. I doubt very much that *C. carbo* occurs on the Pacific side of Kamtschatka otherwise than accidentally, and I regard the two pairs seen by me at Bering Island in the spring of 1883 likewise only as stragglers. *C. carbo* is known to breed on the Kurile Islands, at the Bays of Abrek and of Decastrie, and is also reported from Yezo, the northern island of Japan.

IV.—Synopsis of the species of the genus Cephus.

a^1. A large white patch on the upper surface of the wing.

b^1. Under wing-coverts pure white.

c^1. Greater upper wing-coverts white to the base, only dusky along the basal part of the shafts,* forming no concealed or visible band across the wing-patch.

1. C. mandtii.

c^2. Greater upper wing-coverts, black in their basal half or more,* forming a concealed or visible black band across the wing-patch.

2. C. grylle.

b^2. Under wing-coverts more or less brownish-gray, or smoky, never white.

3. C. columba.

a^2. No white on the upper surface of the wing.

b^1. A whitish patch round the eyes.

4. C. carbo.

b^2. No whitish patch round the eyes.

? 5. C. motzfeldi.

1. Cephus mandtii (Licht.) Newt.

1774.—*Colymbus grylle* Phipps, Voy. tow. N. Pole (p. 186.) (*nec* Lin.).—*Uria g.* Baer, Bull. Scientif. Ac. St. Petersb. iii, p. 352.—Cassin, in Baird B. N. Amer., p. 911 (1858).—*Id.*, Pr. Philada. Acad., 1862, p. 323.—Malmgren, Öfv. Sv. Vet. Acad. Handl. 1863, p. 111.—*Id.*, Jour. f. Orn. 1863, p. 382.—Finsch, 2te Deutsche N. Polfahrt, p. 221 (1874).—Feilden, Ibis, 1877, p. 40.—*Ib.*, P. Z. S., 1877, p. 31.—Nordquist, in Nordenskj. Vega Exped., Am. ed., p. 436 (1881).—Nelson, Cruise Corwin, p. 117 (1883).—*Cepphus g.* Newton, P. Z. S., 1864, p. 495.

1822.—*Uria mandtii* Lichtenst., in Mandt's Obs. Itin. Dissert. (p. 30).—*Id.*, Doubl. Verz., p. 88 (1823).—Faber, Isis, 1824, p. 980.—Keys. & Blas. Wirbelth. Eur., I, p. xcii. (1840).—Naumann, Naturgesch. Vög. Deutschl., xii, p. 462 (1844).—Evans & Sturge, Ibis, 1859, p. 221.—Heuglin, J. f. Orn., 1871, p. 102.—*Cepphus m.* Newton, Ibis, 1-65, p 517.—*Id.*, *ibid.*, 1869, p. 241.—Gillett, Ibis, 1870, p. 307.—Heuglin, J. f. Orn., 1871, p. 100.—*Id.*, *ibid.* 1872, p. 124.—*Id.*, Ibis, 1872, p. 64.

* It will facilitate the determination to pull out one of the feathers.

[1. **Cepphus mandtii** (LICHT.) NEWT.—Continued.]

1824. *Uria glacialis* BREHM, Lehrb. Vög. Eur., pp. 924, 1008.—*Id.*, Isis, 1826, p. 985.—FABER, Isis, 1827, p. 637.—NILSSON, Skand. Faun. Fogl. 3 ed. ii, p. 554.—*Cepphus g.* BREHM, Handb. Vög. Deutschl., p. 991 (1831).

1824. *Uria meisneri* BREHM, Lehrb. Vög. Eur., p. 1006.—*Id.*, Isis, 1826, p. 985.—FABER, Isis, 1827, pp. 637, 638.

1839. *Uria mandstii* LESSON, Rev. Zool., 1839, p. 46 (*err. typ.*).

1844. *Uria grylle mandtii* SCHLEGEL, Rev. Crit., p. cvii.

1847. *Uria grylle* var. *glacialis* SUNDEV., Vög. Scandin. Atl. Livr. iv, pl. —*Id.*, Öfv. Sv. Vet. Akad. Handl., 1863, p. 126.—*Id.*, *ibid.*, 1874, No. 3, p. 22.—MALMGREN, Öfv. Sv. Vet. Akad. Handl. 1864, p. 403.—*Id.*, J. f. Orn., 1865, p. 261.—PALMÉN, Finl. Fogl., ii, p. 668 (1873).

FIGURES.

Dresser, B. of Eur., pt. lxiii and lxiv, pl. —.
Voy. Scandin. Atlas, livr. iv, pl. —.
Audubon, B. of Amer. vii, pl. ccccIxxiv.
Reichenb., Natat., pl. iv, fig. 46.

2. **Cepphus grylle** (LIN.) FLEM.

1758.—*Alca grylle* LIN., Syst. Nat., 10 ed. i, p. 130.—SCHLEG., Mus. P. B. Urinat., p. 17 (1867).—*Colymbus g.* LIN., Syst. Nat., 12 ed., i, p. 220.—*Uria g.* BRÜNN., Orn. Bor., p. 28 (1764).—FABER, Isis, 1827, p. 635.—MACGILL., Hist. Brit. B., v, p. 331 (1852).—NILSSON, Skand. Faun. Fogl., 3 ed., ii, p. 550 (1858).—DEGL. & GERBE, Orn. Europ., ii, p. 603 (1867).—BRANDT, Mél. Biol., vii, 1869, p. 207.—PALMÉN, Finl. Fogl., ii, p. 666 (1873).—KJÆRBÖLL, Danm. Fugl., 2 ed., p. 736 (1877).—FINSCH, 2te Deutsch. N. Polfahrt, ii, p. 221 (1874).—DRESSER, B. of Eur., pt. lxiii, lxiv, (18).—FLEMING, Brit. Anim. (p. 142) (1828).—*Cepphus g.* BREHM, Handb. Vög. Deutschl., p. 987 (1831).—NAUMANN, Naturg. Vög. Deutschl., xii, p. 461 (1844).—NEWTON, Ibis, 1865, p. 519.—COLLETT, Christ. Vid. Selsk. Forh., 1868, sep., p. 78.

1764.—*Uria grylloides* BRÜNN., Orn. Bor., p. 28.

1764.—*Uria balthica* BRÜNN., Orn. Bor., p. 28.

1817.—*Uria leucoptera* VIEILLOT, Nouv. Dict. d'Hist. N., xiv. p. 35.

1819.—? *Grylle scapularis* LEACH, Thoms. Ann. Philos., xiii (p. 60).

1824.—*Uria arctica* BREHM, Lehrb. Eur. Vög., p. 988.

1831.—*Cephus fœroeensis* BREHM, Handb. Vög. Deutschl., p. 990.

1840.—*Uria grœnlandica* GRAY, List. Gen. B. (p. 98).

FIGURES.

Naumann, Naturg. Vög. Deutschl., xii, pl. 330.
Gould, B. Eur. (pl. 399).—*Id.*, B. Gr. Brit., v (pl. 49).
Baird, B. N. Amer., pl. xcvi, fig. 2.

3. **Cepphus columba** PALL.

1790.—*Uria grylle* β. LATHAM, Ind. Orn., ii, p. 797.

1826.—*Cepphus columba* PALLAS, Zoogr. Ross. As., ii, p. 348 (*part*).—*Uria c.* KEYS. & BLAS., Wirbelth. Eur., p. xcii (1840).—CASSIN, U. S. Expl. Exp., Orn., p. 346 (1858).—*Id.*, in Baird's B. N. Amer., p. 912 (1858).—*Id.*, Pr. Philada. Acad., 1862, p. 323.—HEERMANN, Pac. R. R. Rep., x, Birds (p.

[3. Cepphus columba PALL.—Continued.]

76) (1859).—SUCKLEY, Pac. R. R. Rep., xii, pt. ii, p. 285 (1860).—COUES, Pr. Philada. Acad., 1868, Sep., p. 72.—DALL & BANNIST., Tr. Chicag. Acad., i, 1869, p. 309.—BRANDT, Mél. Biol., vii, 1869, p. 207.—FINSCH, Abh. Brem. Ver., iii, 1872, p. 78.—DALL, Avif. Aleut. Isl., Unal., eastw., p. 11 (1873).—*Id.*, Avif. Aleut. Isl., west Unal., p. 10 (1874).—TACZAN., Bull. Soc. Zool. France, 1877, p. 51.—*Id.*, *ibid*, 1883, p. 398.—BLAKIST. and PRYER, Tr. As. Soc. Jap., x, 1882, p. 91.—BEAN, Pr. U. S. Nat. Mus., 1882, p. 172.—NELSON, Cruise Corwin, p. 117 (1883).—HARTLAUB, J. f. Orn., 1883, p. 285.

1832.—*Uria grylle* KITTLITZ, Isis, 1832, p 1105 (*nec* LIN.).—*Id.*, Denkw. Reise, i, pp. 273, 291.—?*Cepphus g.* WHITELY, Ibis, 1867, p. 210.

FIGURES.

Voy. Vincennes and Peacock, Orn. Atlas, pl. 38, fig. 1.
Baird, B. N. Amer., pl. xcvi, fig. 1.

4. Cepphus carbo PALL.

1826.—*Cepphus carbo* PALLAS, Zoogr. Ross. As. ii p. 350.—NEWTON, Ibis, 1865, p. 519.—*Uria c.* BRANDT, Bull., Scientif. ii, 1837, p. 346.—*Id.*, Mél. Biol., vii, 1869, p. 206.—MIDDEND., Sibir. Reis. ii, 2 (p. 239) (1853).—SCHRENCK, Reis. Amurl. i, p. 496 (1860).—CASSIN, Pr. Philada. Acad., 1862, p. 323.—COUES, Pr. Philada. Acad., 1868, Sep. p. 73.—TACZAN., Bull. Soc. Zool. France, 1877, p. 51.—BLAKIST. and PRYER, Tr. As. Soc. Japan., x, 1882, p. 90.—*Alca c.* SCHLEGEL, Mus. P. B. Urinat., p. 17 (1867).

FIGURES.

Gould, B. Asia, pl. —.
Middend., Sibir. Reis. ii, 2 (pl. xxiii, fig. 6).
Reichenb., Natatores, pl. cccIxxv, figs. 2937-39.
Baird, B. N. Amer. pl. xcvii.

5. Cepphus motzfeldi (BENICK.) STEJN.

1824.—*Uria motzfeldi* BENICKEN, Isis, 1824, p. 889.

1824.—*Uria unicolor* FABER, Isis, 1824, p. 981.—BREHM, Isis, 1826, p. 988.—*Id.*, Handb. Vög. Deutschl., p. 985 (1831).—SCHLEGEL, Rev. Crit., p. 106 (1844).—BONAP., Compt. Rend., xlii, 1856, p. 774.—*Id.*, Catal. Parzud., p. 12 (1856).

1842.—"*Grylle carbo* BRANDT" BP., Cat. Met. Ucc. Eur., p. 82, (ex Bor. Eur. or. As.) (part. nec PALL., nec BRANDT).—"*Uria carbo* Brit. Mus. ex Iceland," NEWTON, Ibis, 1865, p. 518.

1867.—*Alca grylle* SCHLEGEL, Mus. P. B. Urinat., p. 20, (*part*) n. 27.—*Uria g.* KUMLIEN, Bull. U. S. Nat. Mus. 15, p. 104 (*part*).

(NO FIGURE.)

SMITHSONIAN INSTITUTION,
Washington, D. C., June 15, 1884.

NOTES ON FISHES COLLECTED BY DAVID S. JORDAN AT CEDAR KEYS, FLORIDA.

By DAVID S. JORDAN and JOSEPH SWAIN.

In the month of November, 1883, two days were spent at Cedar Keys, Fla., by Professor Jordan, in making collections of fishes. The seine was drawn on the sand-flats in the harbor, and the catches of the seine fishermen along the shore, and of the hook-and-line fishermen in deeper water were examined. The fauna appears to differ in no important respect from that of Pensacola. Cedar Keys are a little farther south, and hence species of *Malthe* and *Gerres* are more abundant than at Pensacola, while *Diplodus holbrooki*, unknown at the latter point, is here a common food-fish. We are indebted to Mr. A. Bettelini, fish-dealer at Cedar Keys, for numerous specimens.

1. **Pristis pectinatus** Latham. *Sawfish.* Rather common.

2. **Clupea pensacolæ** (Goode & Bean) Jordan.

Color in life light-greenish above, a yellow shade above opercle and humeral region, and on snout above; sides of back with three or four bronze streaks along middle of rows of scales, the one along the lower dark row most conspicuous; iris and lower jaw gilt; sides of head iridescent; dorsal and caudal fins yellowish and dotted with darker; other fins translucent; no opercular spot.

The genus *Harengula* seems to us not tenable. *Cl. sardina* Poey, a near ally of *Cl. pensacolæ*, has the scales formed much as in the latter, but as readily deciduous as in the other herrings.

3. **Stolephorus browni** (Gmelin) Jordan & Gilbert.

Three specimens, each with the anal rays i, 20.

4. **Synodus fœtens** (Linnæus) Gill.

Several specimens taken with the seine.

5. **Fundulus similis** (Baird & Girard) Günther.

Common.

6. **Fundulus heteroclitus grandis** Baird & Girard.

Common. We have compared the specimens taken at Cedar Keys with examples of the true *heteroclitus* from Wood's Holl, Mass.; the former have the body more robust, the fins and back darker, and the light spots of body and fins larger and paler. The scales on top of head are usually larger in the specimens from Cedar Keys. The fins are scarcely lower than in the true *heteroclitus*. In some specimens the dorsal is $1\frac{4}{5}$ in head and anal $1\frac{1}{2}$ in head. As these characters are more or less variable, *grandis* should probably be considered as a Gulf form of *F. heteroclitus*, a subspecies rather than a species.

7. **Hemirhamphus unifasciatus** Ranzani.

Abundant; taken with the seine.

8. **Tylosurus marinus** (Bloch & Schneider) Jordan & Gilbert.

Abundant in the harbor; taken with the seine.

9. **Siphostoma affine** (Günther) Jordan & Gilbert.

A single specimen 3 inches in length. Color of body in spirits plain light olive, there being no spots on back; caudal fin dusky; other fins plain olive. A dark horizontal streak on snout and eye. Rings 16 + 31. Dorsal covering 3 + 5 rings. The body of this specimen is more slender than is common in this species, giving it the appearance of *S. louisianæ*. Two specimens from Key West present the same appearance and characters.

10. **Mugil albula** Linnæus. *Mullet.*

Common. The most abundant food-fish at Cedar Keys, at least in November, which is near its spawning time.

11. **Menidia vagrans** (Goode & Bean) Jordan & Gilbert.

Common in the shallows of the harbor. In these specimens the number of anal rays varies from i, 15 to i, 18, thus differing from *M. laciniata* of the South Atlantic coast, which has the anal rays i, 19 to i, 21.

12. **Menidia peninsulæ** (Goode & Bean) Jordan & Gilbert.

Common, with the preceding. The specimens taken are unusually large for this species.

13. **Oligoplites saurus** (Bloch & Schneider) Jordan & Gilbert.

(*Chorinemus occidentalis** Cuv. & Val.)

One specimen taken with the seine.

14. **Trachynotus carolinus** (Linnæus) Gill. *Pompano.*

Common; the most highly-valued food-fish at Cedar Keys.

15. **Caranx hippos** (Linnæus) Günther. *Jack.*

Not rare.

16. **Serranus atrarius** (Linnæus) Jordan & Gilbert. *Blackfish.*

Common.

*We have rejected the Linnæan name *occidentalis* for this species, not finding any evidence that the original *Gasterosteus occidentalis* of the Systema Naturæ, x. p. 295, was this fish. The later reference of the figure of *Oligoplites* in Brown's Jamaica to the synonymy of "*Gasterosteus occidentalis*," does not prove that the specimen in the Museum de Geer was an *Oligoplites*.

The following is the original account, which is both incorrect and insufficient:

"Occidentalis 3, G. spinis dorsalibus septem, spinisque duabus ante pinnam analem, D. 7, 11; P. 7; V. 6; A. 2, $\frac{1}{7}$; C. 16. *Habitat in* America. *Mus. De Geer.*"

The earliest name clearly belonging to this fish is that of *Scomber saurus* Bl. & Schn., based on the figure of Brown.

17. **Epinephelus morio** (Cuvier) Gill. *Red Grouper.*

Common in deep water; taken with hook and line on the snapper banks.

18. **Epinephelus stomias** (Goode & Bean) Jordan. *Gag.*

With the preceding, but rather less common. Grows to a much larger size than *E. morio*. From Cedar Keys southward the name "Gag," is universal for this species, the name "Black Grouper" being given to *E. brunneus* (Poey).

19. **Calamus arctifrons** Goode & Bean.

One young specimen taken in the seine.

In life this specimen was silvery, bluish or iridescent above, the centers of many of the scales pearly, especially above and between the spots. A row of about six rather faint salmon-olive spots along lateral line. Above these, below base of dorsal, a row of faint large diffuse blotches of the same color, and below the first series a series of faint smutty tinges, making the whole form a series of obscure and broken cross-bars. Preorbital pale salmon color with a few faint vermicular streaks. A light blue streak along lower side of eye and extending obliquely forward. Interorbital space yellowish, preceded by bluish lines. Both dorsals and anal marked with small spots of dusky salmon color; similar spots forming undulating cross-bars on caudal. Ventrals bluish-white, faintly barred. Pectorals pale.

20. **Lutjanus caballerote** (Bloch & Schneider) Poey. *Gray Snapper; Lawyer; Mangrove Snapper.*

Common. The young about the shores are called gray snapper or Lawyer, and have been wrongly identified by authors with *Lutjanus caxis*, a species not known from farther north than Key West.

21. **Lutjanus campechianus** Poey. *Red Snapper* (*Lutjanus blackfordi* Goode & Bean).

22. **Pomadasys chrysopterus** (L.) Goode & Bean* MSS. *Pigfish.* (*Pristipoma fulvomaculatum* and *P. fasciatum*, C. & V.)

Common, taken in the seine.

23. **Hæmulon plumieri** (La Cépède). *Grunt.*

Not very common.

24. **Diplodus probatocephalus** (Walbaum) Jordan & Gilbert. *Sheep's-head.*

Abundant; one of the most valued of the "bottom-fish," *i. e.*, fish taken in the seine.

25. **Diplodus holbrooki** (Bean) Jordan & Gilbert. *Sailors' Choice.*

Color in life, silvery, slightly bluish above; top of head and the preorbital tinged with yellowish; a faint orange blotch under junction of spinous and soft rays of dorsal; a deep orange blotch on and under

*We are informed by Dr. Bean that the Linnæan type of *Perca chrysoptera* examined by him in London belongs to *Pomadasys fulvomaculatus.*

last rays of dorsal; a large blackish blotch on caudal peduncle above and extending down its side to anal. Soft dorsal and anal margined with dusky; axil slightly dusky. Ventrals dusky bluish. Pectorals pale. Edge of opercular flap, dusky. Rather common; considered a good food-fish.

26. **Diplodus rhomboides** (Linnæus) Jordan & Gilbert.

Very common.

27. **Pogonias chromis** (Linnæus) Cuvier & Valenciennes. *Drum.*

Rather common.

28. **Sciæna chrysura** (La Cépède) Jordan & Gilbert.

A few seen.

29. **Sciæna ocellata** (Linnæus) Jordan & Gilbert. *Red Bass.*

Common. One of the most abundant food-fish, as elsewhere on the Gulf coast. Like other Sciænoids, this species abounds in sandy bays at no great depth.

30. **Liostomus xanthurus** La Cépède

Not abundant.

31. **Cynoscion maculatum** (Mitchill) Gill. *Sea Trout.*

An abundant and valuable food-fish.

32. **Gerres gula** Cuvier & Valenciennes.

Extremely abundant on shallow beaches. The synonymy of this species given by Evermann and Meek (Proc. Ac. Nat. Sci., Phila., 1882) appears to be fully justified.

33. **Gerres lefroyi** (Goode) Günther.

A single specimen obtained; the most northern record of this species.

34. **Prionotus tribulus** Cuvier & Valenciennes.

One young specimen.

35. **Batrachus tau** (Linnæus) Cuvier & Valenciennes. *Toadfish.*

Common about the wharves.

36. **Paralichthys albigutta** Jordan & Gilbert. *Flounder.*

The commonest of the flounders at Cedar Keys. Several specimens taken larger than any of the original types. The largest of these ($14\frac{1}{2}$ inches long) has been sent to the National Museum. (No. 35085.)

Color in life grayish, obscurely blotched with darker, and finely marbled with different shades. Sides with several dark ocelli, larger than eye, and bounded by pale outlines. The whole head and body with round creamy spots, smaller than pupil, nearly equally distributed and irregularly mingled with finer dots. Fins colored like body, but paler and more reddish-brown. The *young* are rather more faintly marked.

It has been suggested that the type of *Citharichthys microstomus* Gill (Proc. Ac. Nat. Sci., Phila. 1864, 223) is *Etropus crossotus* rather than *Citharichthys spilopterus*, to which species it has been referred by Jordan & Gilbert (Syn. Fish N. A., p. 817). The fin rays and scales agree fairly with either, but the statements that the height enters $2\frac{2}{3}$ times in the extreme length, and that the mouth is "rather small" (for a *Citharichthys*), show that Dr. Gill's fish could not have been an *Etropus*.

37. Aphoristia plagiusa (Linnæus) Jordan & Gilbert.

One specimen taken.

38. Paralichthys ommatus Jordan & Gilbert.

Rather common.

39. Etropus crossotus Jordan & Gilbert.

Four specimens of this species, each with about 42 scales in the lateral line, and 76 developed rays in the dorsal fin. The type of this species from Mazatlan had 48 scales in the lateral line, and 80 rays in the dorsal. The specimens from Cedar Keys have the body rather deeper than those from Mazatlan, $1\frac{3}{4}$ in total length without caudal. We are not, however, prepared to consider the Atlantic fish as a distinct species.

40. Malthe vespertilio (Linnæus) Cuvier.

Very abundant on the sandy bottoms in the harbor. Among the eighteen specimens of this species brought from Cedar Keys the forms known as *Malthe cubifrons* and *Malthe nasuta* (*notata ; truncata*), both occur. The characters, however, upon which these species have been separated from *M. vespertilio* are so variable that we can consider them as of individual value only, and we refer both *cubifrons* and *nasuta* to the synonymy of *M. vespertilio*. The form of the rostral process varies in these specimens from that of a button-like tubercle, not projecting beyond the snout, to a long conical process, one-tenth the length of the fish to base of caudal. All intermediate forms and lengths are found among these specimens. The rostral process appears to become shorter with age, but there are exceptions to this rule. The width of the head between anterior angles of orbits is usually greater in the specimens with button like rostral process. The height of the rostral cavity is greater than the width in all our specimens from Cedar Keys, but a fish from Egmont Key, which is evidently not specifically different, has this cavity broader than high. The round black spots on the back are conspicuous in life, but they grow fainter, and sometimes disappear, in spirits. The belly in life is of a coppery red.

41. Tetrodon nephelus Goode & Bean.

A single specimen was obtained. It has no prickles anywhere on the body, but otherwise is not evidently different from *T. nephelus*. Many similar specimens, as well as others prickly in various degrees, have been since obtained by Professor Jordan at Key West.

INDIANA UNIVERSITY, *January* 25, 1884.

LIST OF FISHES OBSERVED IN THE SAINT JOHN'S RIVER AT JACKSONVILLE, FLORIDA.

By DAVID S. JORDAN and SETH E. MEEK.

One day in the month of November, 1883, was spent by Professor Jordan at Jacksonville, Fla., in a study of the fishes of the markets. The following is a list of the species seen. The *Cyprinodontidæ* were taken from a small brook south of the town, a few of the others were caught with a hook from the wharves, while the others were seen in the markets, whither they had been brought from the mouth of the river. Only the *Ictalurus* and the *Cyprinodontidæ* were preserved. These are in the National Museum.

1. **Ictalurus niveiventris** (Cope) Jordan & Gilbert.

One specimen 12½ inches in length taken with a hook on the wharf. Head 3⅔ in length; width of head 4¾ in length; eye 4 in interorbital area; origin of dorsal scarcely nearer end of snout than adipose fin; length of dorsal spine 3 in distance from tip of snout to root of spine; upper jaw projecting slightly beyond lower; maxillary barbels scarcely reaching gill-openings; pectoral spine large, retrorse-serrate on its inner edge; humeral process more than half the length of pectoral spine, very rugose; anal shorter than head, its longest ray 2 in base of fin; caudal weakly forked, its inner rays about 1⅔ in outer ones, lower lobe broader than upper; adipose fin large. This fish differs but slightly from Cope's description (Proc. Amer. Phil. Soc., 1870, 486). Hitherto only the original type had been known, from the Neuse River, in North Carolina.

2. **Gambusia patruelis** (Baird & Girard) Girard.

Numerous specimens, the largest 2 1/10 inches in length, taken from a small bank near Jacksonville. At this season (November) the young are undeveloped in the ovaries. The characters noticed by Jordan & Gilbert (Proc. U. S. Nat. Mus., V, 1882, 257) as separating *Gambusia patruelis*, from *Gambusia holbrooki*, do not seem constant in these specimens. The head varies from about 3⅔ to 3⅞ in length of body, and the eye from 1½ to 1¾ in length of head. Sufficient variation will no doubt be found to exist in specimens taken from different streams to render it necessary to regard *G. holbrooki* as fully identical with *G. patruelis*. The dark cross-streaks on the caudal are sharply defined, especially in the larger specimens, which are the largest of this species yet seen by us.

3. **Mollienesia latipinna** Le Sueur.

Seven specimens, females 5, males 2; the largest a female 2.1 inches in length; dorsal rays 13; its insertion behind a vertical from root of ventrals, more notably so in female specimens; eye about 2⅞ in head,

and $1\frac{3}{5}$ in interorbital width; no dark vertical half-bars noticeable on the sides of these specimens. These specimens are therefore intermediate between *Mollienesia latipinna* and *Mollienesia lineolata*, as characterized by Jordan & Gilbert (Proc. U. S. Nat. Mus., V, 1882, 258–260). Doubtless these differences noted are mere local variations in specimens from different waters.

4. Heterandria formosa Agassiz.

Head $3\frac{1}{2}$ to $3\frac{2}{3}$ in length; depth, $3\frac{3}{4}$ to 4; D., 7; A., 8 or 9; scales in lateral line, 28. Body short, slightly compressed. Snout very short, about two-thirds eye. Eye large, 3 in head. Mouth terminal, slightly oblique. Lower jaw slightly projecting. Jaws each with a series of small, pointed, movable teeth. Gill membranes united. Dorsal fin short, on posterior part of body; its origin above, on a vertical, from middle of anal, and about midway between end of snout and tip of caudal fin. In male specimens the anal is considerably in advance of dorsal, and is transformed into an intromittent organ. Caudal fin rather long, about 5 in body, slightly dusky at its tip.

Color in spirits brownish-olive. A dark band about as wide as eye extends from mouth through eye and along middle of the side, terminating in a black spot at base of caudal. This band is crossed with from 6 to 9 brownish-black vertical streaks which become fainter with age, the anterior ones the less prominent. These markings are made up of small dark dots; 6 black spots on base of dorsal and anal fins.

Description from about 30 specimens, both sexes represented, taken from a small brook near Jacksonville. The largest is 0.9 inch in length. The genus *Heterandria* was proposed by Agassiz (Amer. Journ. Sci. Arts, XVI, 135) in 1853 to include certain Cyprinodonts which have the anal fin in the male modified. The two species mentioned, *holbrooki* and *formosa*, belong to different genera, which correspond respectively to Poey's *Gambusia* and *Girardinus*. These occur in the *Memorias sobre la Historia Natural de la Isla de Cuba* (I, p. 390). The date assigned to their appearance by Girard (Proc. Ac. Nat. Sci., Phila., 1859–'61) is the year 1851, which would give both two years priority over *Heterandria*. Günther and Jordan & Gilbert have accepted this date without challenge. It is, in fact, the date given on the title page of the *Memorias*, but the volume was issued in parts, its publication extending over several years, and the issue of the part containing *Girardinus* and *Gambusia* could not have been earlier than 1855. This is evident, as papers written in 1854 are printed in the text before it.

In place either of *Gambusia* or *Girardinus* the name *Heterandria* must therefore be used. It has not yet been restricted to either so far as we know. We therefore propose to restrict it to the type of *Girardinus*, regarding *Heterandria formosa*, Agassiz as its type. This arrangement is in accordance with the wishes of Professor Poey, to whom we

are indebted for the information that his *Girardinus* is subsequent to *Heterandria*.

5. **Mugil albula** (Linnæus). *Mullet.*

Very abundant; full of ripe spawn. November 20.

6. **Lepomis pallidus** (Mitch.) Gill & Jordan. *Brim.*

7. **Lepomis holbrooki** (Cuv. & Val.) McKay. *Brim.*

8. **Pomadasys chrysopterus** (Linn.) Goode & Bean. *Hog fish.*

9. **Diplodus probatocephalus** (Walb.) Jordan & Gilbert. *Sheep's-head.*

10. **Pogonias chromis** (L., Cuv. & Val.)

11. **Sciæna ocellata** (L.) Günther. *Red Bass.*

12. **Liostomus xanthurus** La Cépède.

13. **Micropogon undulatus** (L.) Cuv. & Val. *Croaker.*

14. **Menticirrus alburnus** (L.) Gill. *Whiting.*

15. **Cynoscion maculatum** (Mitchill) Gill. *Trout.*

16. **Paralichthys lethostigma** Jordan & Gilbert MSS. (nom. sp. nov.).
(*Paralichthys dentatus* Jor. & Gilb. Syn. Fish N. A., 822, not *Pleuronectes dentatus* L. *fide* Bean.*)

NOTES ON THE PIPE-FISHES OF KEY WEST, FLORIDA, WITH DESCRIPTION OF *Siphostoma McKayi*, A NEW SPECIES.

By JOSEPH SWAIN AND SETH E. MEEK.

The collection of pipe-fishes upon which this paper is based was obtained by Professor Jordan at Key West, Fla., during his recent visit to that place. Besides the single species, which is apparently new to science, we find in this collection all the species, except *Siphostoma fuscum*, hitherto known from the Atlantic coast of the United States.

We wish to express our indebtedness to Professor Jordan for the use of his library and for kindly aid.

The synonymy of the different species has been already published by Mr. Swain (Proc. U. S. Nat. Mus., 1882, 307–315), and the National Museum has specimens of all the species here recorded.

Analysis of species of the genus *Siphostoma*, found in the United States.

a. Top of head strongly carinated.

b. Breast shields not covered by soft skin; opercle with a prominent ridge; snout short; D. 22 or 23, covering 1 + 4 rings; rings, 18 + 30; belly concave; twelve irregular brown cross-bars on body. (*Corythroichthys* Kaup.). ZATROPIS, 1

bb. Breast shields covered by soft skin; D. 41; rings, 19 + 39. (*Dermatostethus* Gill.) ..... PUNCTIPINNE, 2

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* Dr. Bean, who has examined the Linnæan type of this species, now preserved in London, identifies it with the species called *P. ophryas* or *P. ocellaris* by Jordan & Gilbert.

aa. Top of head with a slight carination or with none; opercle without prominent longitudinal ridge. (*Siphostoma.*)

c. Dorsal fin covering 1 + 9 rings; snout usually long; size large.

d. Rings 20 to 21 + 45 to 49; D. 39 to 46; top of head without keel. CALIFORNIENSE, 3

dd. Rings 18 to 19 + 39 to 42; D. 36 to 41; top of head slightly keeled. GRISEOLINEATUM, 4

cc. Dorsal fin covering 1 + 6 or 7 rings. (Occasionally 2 + 6 in *S. floridæ.*)

e. Rings 15 + 38; D. 29 to 30; top of head distinctly keeled; snout short. AULISCUS, 5

ee. Rings before vent, 16 to 19.

f. Dorsal fin low, not longer than head.

g. Rings 18 + 31; D. 34; snout short; body comparatively stout; tail short ..... BARBARÆ, 6

gg. Rings 17 to 19 + 36 to 41; D. 30 to 32; snout moderate or rather short; body slender ..... LEPTORHYNCHUS, 7

ggg. Rings 17 to 18 + 31 to 33; D. 27 to 31; snout rather long. FLORIDÆ, 8

ccc. Dorsal fin covering 3 + 5 (sometimes 3 + 4) rings.

h. Dorsal fin very high; rings 16 to 18 + 30 to 33; D. 25 to 32; belly in female with black carina; snout rather short; sides of body with narrow vertical streaks in life; dorsal spotted ..... AFFINE,* 9

hh. Dorsal fin not very high; rings 20 to 21 + 36 to 38; D. 32 to 37; belly flat or slightly concave; snout moderate ..... LOUISIANÆ, 10

cccc. Dorsal fin covering 5 + 4 or 4 + 5 rings; rings 18 to 20 + 36 to 40; D. 36 to 40; snout moderate ..... FUSCUM, 11

ccccc. Dorsal fin covering 2 + 5 to 6 rings; rings 18 + 33; D. 29 to 31; opercle not keeled; body deep; its greatest depth in adult females equal to width of 4 body rings (2½ in males); snout about 1¼ in head; belly in females angulate, without keel; dorsal pale, marked with dark green; opercle and snout barred with white ..... MCKAYI, 12

cccccc. Dorsal fin covering 0 + 4 (occasionally ½ + 4) rings; top of head slightly keeled; snout very short, 3 in head; rings 16 + 37 to 39; D. 17; belly convex; color in spirits dusky gray, with about 13 conspicuous cross-bars, each wider than a body ring ..... CRINIGERUM, 14

1. Siphostoma zatropis Jordan & Gilbert.

Two specimens taken at Key West, each with rings 16 + 27; dorsal with 22 rays, covering 1 + 4 rings.

6. Siphostoma barbaræ Swain, sp. nov.†

8. Siphostoma Floridæ Jordan & Gilbert.

Four specimens obtained, with dorsal rays 27 to 29, covering 1 + 7 rings. In addition to these we have referred to this species two female

*NOTE.—In the key to this genus, formerly published by Mr. Swain (Proc. U. S. Nat. Mus., 1882, 308), this species was inadvertently placed under *cc*, "Dorsal fin covering 1 + 7 rings," instead of under *ccc*, "Dorsal fin covering 3 + 5 rings."

This error is copied in Jordan & Gilbert's Synopsis Fishes N. A., p. 906. It is here corrected.

† *Siphostoma barbaræ* Swain, sp. nov. This name is proposed for the specimen taken by Andrea Larco at Santa Barbara, Cal. (No. 31253 U. S. Nat. Mus.), described by Mr. Swain, Proc. U. S. Nat. Mus., 1882, 311, under the erroneous name of *Siphostoma bairdianum*. We are informed by M. Alexandre Thominot, of the Museum of Paris, who has re-examined the type of *Syngnathus bairdianus*, that the specimen has the dorsal fin on 3 + 5½ rings, as stated by M. Duméril. *S. bairdianum* is therefore a different species, apparently closely allied to *S. affine.*

specimens, differing from the typical *S. floridæ* in the following characters: The dorsal covering 2 + 5 or 6 rings, the keel of belly distinct, no cross-bars on sides of body; D. 29 to 31, rings 19 to 20 + 33. These, perhaps, represent a distinct species, but we think it more likely an extreme variation of *S. floridæ*.

9. **Siphostoma affine** (Günther) Jordan & Gilbert.

Many specimens obtained in greater abundance than any other species. D. 25 to 28. We have also examined two specimens of this species in the museum of Yale College, collected by Prof. C. F. Hartt at Abrolhos Reef, off the east coast of Brazil.

10. **Siphostoma louisianæ** (Günther) Jordan & Gilbert.

Seven specimens in the collection.

12. **Siphostoma McKayi**, sp. nov.

Head $5\frac{2}{3}$ to $6\frac{1}{4}$ in total length; D. 29 to 31; rings 18 + 33 to 34.

Snout rather long, compressed, $1\frac{3}{4}$ to 2 in head, its median line with a slight keel above and below, with smaller keels on each side; opercle not keeled.

Dorsal somewhat higher than width of a body ring, its base about $1\frac{1}{3}$ in length of head, covering 2 + 6 rings. Pectoral higher than length of base; tail about $1\frac{5}{6}$ in total length of fish; body deep; its greatest depth in adult females equals width of 4 body rings.

Color in spirits grayish or dark olive; the males often with gray cross-bars on the sides; the body is usually more or less spotted with small white spots. Dorsal pale, usually dotted over with darker; caudal dusky, generally spotted with white; opercle usually with white bars.

This species is described from three female and six male specimens, obtained by Professor Jordan at Key West. Some of these typical specimens (No. 34989) are now in the United States National Museum. This species is named for our friend and fellow-student, Charles Leslie McKay, of the United States Signal Service, who recently lost his life in the cause of science in Alaska.

14. **Siphostoma crinigerum** Bean & Dresel.

Bean & Dresel, Proc. Biol. Soc. Wash. II, p. 99.

Four specimens, with dorsal rays 17, covering 0 + 4 (one example $\frac{1}{2}$ + 4) rings; rings 16 + 37; snout very short, 3 in head; size small. Two specimens of pipe fish in the museum of Yale College, obtained by Prof. C. F. Hartt at Abrolhos Reef, off the east coast of Brazil, appear to belong to this species.

INDIANA UNIVERSITY, *February* 26, 1884.

DESCRIPTIONS OF *Physiculus fulvus* and *Lotella maxillaris*, NEW SPECIES OF FISHES COLLECTED IN 1881 BY THE UNITED STATES FISH COMMISSION.

By TARLETON H. BEAN,

Curator, Department of Fishes, United States National Museum.

The gadoid fishes described below have been withheld from publication for some time with the expectation that larger examples of the same species would be secured by one of the steamers of the Fish Commission. No additional material, however, has been obtained, and further delay seems undesirable.

Physiculus fulvus, n. s.

Physiculus dalwigkii has been credited to the fauna of the western Atlantic by Jordan and Gilbert (Syn. Fishes North America, 1883, p. 801). The description was borrowed from Günther's Catalogue, and the species was recorded on the strength of a doubtful identification with *Physiculus dalwigkii*, of a species of *Lotella*(?), which seems to be still undescribed. There is in the collection a species of *Physiculus* related to *dalwigkii* and represented by three young examples which were obtained at Station 941 in 76 fathoms. The catalogue number of these specimens is 28766. They were taken August 4, 1881, in north latitude 40° 01′ and west longitude 69° 56′, by the United States Fish Commission steamer Fish Hawk. The largest of these examples is 3½ inches in length. It is one of the three individuals referred to in my list of fishes published by Professor Verrill in American Journal Science and Arts, vol. xxii, 1881, p. 296, under the name *Physiculus*, sp. It is number 15 of that list.

Description.—The head is broad and depressed, with a short snout; the length of the head is contained in the total length to the caudal base nearly 4 times. The height of the body is about equal to the length of the head without the snout, and is contained 4⅔ times in the total length without caudal. The eye is about two-sevenths as long as the head. The length of the upper jaw is about equal to the space between the ventrals and the anal origin, and is contained 2¼ times in that of the head. The maxilla does not quite reach the vertical through the hind margin of the eye. The barbel is one-sixth as long as the head. The teeth are in narrow bands in the jaws; there is no outer series of enlarged teeth, but a few in the middle of the bands in both jaws are slightly larger than the others; all of the teeth, however, are inconspicuous: the vomer and palate are smooth. The vent is situated about under the third ray of the first dorsal. The distance of the first dorsal from the tip of the snout equals 3 times the length of its base; its longest ray equals twice the length of the snout, and slightly exceeds the length of the longest of the second dorsal; the length of the

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second dorsal base equals 3 times the length of the pectoral, which is contained nearly 5½ times in the total without caudal. The origin of the anal is about in a vertical let fall from the base of the fifth ray of the first dorsal. The distance of the ventral from the tip of the snout is contained 4½ times in the total length to caudal base. The longest ventral ray is contained about 5¾ times in the standard body-length. When the ventral is extended backward its tip will reach the base of the fourth anal ray. The length of the middle caudal ray is one-third of the length of the head. The lateral line is very indistinct, but it is situated rather high, and follows pretty closely the contour of the back. The gill-rakers are moderately short and not numerous.

The general color is a light yellowish-brown with the under surface of the head, the abdomen, the margins of the dorsal and anal fins, the lips, and the axil of the pectoral very dark brown. There is, also, a dark brown blotch on the suboperculum. The inside of the mouth and of the gill-membranes are white.

Radial formula.—D. 10, 49; A. 54; V. 7. Scales 6–61 to 62–16.

Lotella maxillaris, n. s.

The little fish which I at one time supposed to be similar to *Physiculus dalwigkii* is not that species, and it appears to belong to a different genus. I refer it, with some doubt, to the genus *Lotella*. The ventrals have a flat base and several rays. The vomerine teeth seem to be absent, and there is an outer series of stronger teeth in the jaws. The first dorsal also contains but five rays. The lower jaw, however, projects very slightly beyond the upper. I am induced to describe it here simply to call attention to its presence in our waters, and hope that better material may be soon obtained upon which to base a more nearly complete account.

Description.—A single individual was taken by the United States Fish Commission steamer "Fish Hawk," August 23, 1881, at Station 952, in north latitude 39° 55′ and west longitude 70° 28′, in 396 fathoms. The specimen is only 2⅔ inches in length. The catalogue number of the type is 29832. It is No. 14 of my list of fishes published by Professor Verrill (Amer. Jour. Sci. and Arts, vol. xxii, 1881, p. 296). The head is moderately compressed; the snout is short. The length of the head is contained about 4⅓ times in the total length without caudal; the height of the body 5 times. The eye is one-third as long as the head. The maxilla reaches to the vertical through the anterior margin of the pupil; its length equals that of the postorbital part of the head. The teeth are in narrow bands in the jaws, the outer series being enlarged. The vomer and palate seem to be without teeth. The vent is situated about under the eighth ray of the second dorsal. The distance of the first dorsal from the tip of the snout is contained 4

times in the total length, including caudal. The ventrals extend to about the vertical from the origin of the second dorsal, and do not reach nearly to the vent. The longest ray of the first dorsal is a little more than one-half as long as the head. None of the rays of the second dorsal or of the anal are as long as the first ray of the first dorsal. The longest ray of the second dorsal does not much exceed one-half the height of the body. The longest ray of the anal is about one-half the length of the ventral. The origin of the anal is about under the tenth ray of the second dorsal. The ventrals are situated about under the beginning of the posterior third of the head; their length equals one-fourth of the length of the second dorsal base. The origin of the pectoral is somewhat in advance of that of the first dorsal. The fin is imperfect, but its length probably slightly exceeds that of the ventral. The caudal is rounded.

D. 5, 55; A. 44; V. 10.

Owing to the condition of the specimen it is very difficult to count the small scales, but there are about 7 or 8 rows between the origin of the first dorsal and the lateral line and about 14 or 15 rows between the origin of the anal and the lateral line. The number in the lateral line is at least 115 to the origin of the caudal.

The color of the type at present is a very light brown. The margins of the dorsal and anal, in their posterior portions, are blackish.

ON THE OCCURRENCE OF THE STRIPED BASS IN THE LOWER MISSISSIPPI VALLEY.

By TARLETON H. BEAN,

Curator, Department of Fishes, United States National Museum.

On the 7th of April, 1883, Mr. Thomas S. Doron, of Montgomery, Ala., sent to the Museum a large striped bass which was caught in the Alabama River near Montgomery. The fish is a gravid female, measuring nearly 3 feet in total length. The depth was so considerable that the identity of the species with the striped bass of the east coast was at first questioned and an effort was made to secure smaller individuals from the same region for the purpose of comparison with east-coast specimens. Until recently, however, no young examples were obtained. The Museum has a specimen of the common striped bass, number 21312, from Pensacola, Fla., whence it was sent by Mr. Silas Stearns; this example which is 16 inches long, has been compared with one of equal size from Wood's Holl, Mass., and shows no differences from the common form. While the occurrence of the striped bass in the Gulf of Mexico has been established for several years we have not until now been certain that it exists, also, in the Mississippi Basin. The specimen recently obtained from Mr. J. Dock Harrell, of Osyka, Miss., enables us to decide

this most interesting point in the distribution of the species. Mr. Harrell obtained his specimen from the Tangipahoa River, near Osyka. He states, in a letter to Professor Baird, dated July 5, 1884, that some of the fish caught there weighed from 2 to 3 pounds each. In a subsequent letter, July 16, 1884, he writes that the fish of the species sent are becoming numerous in those waters; that since he forwarded the fish others of the same size have been caught and great schools of still smaller ones have been seen; also, that specimens weighing from 4 to 6 pounds each have been taken.

There is no doubt whatever in my mind that the striped bass, *Roccus striatus*, occurs in the Lower Mississippi Valley; but it may be well to record the following notes and measurements concerning two of the individuals now in the Museum as a basis for future comparisons.

The small specimen, number 35144, has the lingual teeth in 4 patches, the two patches at the base of the tongue being separated by only a very narrow interspace. In this example the last 4 gill-rakers below the angle are rudimentary.

In the large example from Montgomery the lingual teeth are in 4 patches, those at the base being very slightly separated. The length of each patch at the base of the tongue is 13 millimeters, which is a little less than one-third of the length of each palatine patch. The number of gill-rakers above the angle is 10, below the angle 12. The longest gill-raker is 26 millimeters in length, and its greatest width is 8 millimeters. The gill-rakers are blunt at the end, compressed, finely-toothed on their inner surface. The depth of the exposed portion of the largest scale is 19 millimeters. There are about 7 black stripes on the body, one of which incloses the lateral line. Between some of the stripes on the back there are some much narrower accessory ones.

Complete measurements of the specimens are appended:

Measurements.

Current number of specimen	35144	32629 ♀
Locality	Tangipahoa River, Mississippi.	Alabama River, Alabama.
	Millimeters.	Millimeters.
Length to origin of middle caudal rays	206	765
Body:		
Greatest height	55	270
Greatest width	29	130
Height at ventrals	55	240
Least height of tail	22	73
Length of caudal peduncle	36	124
Head:		
Greatest length	66	226
Length of longest gill-raker	9	26
Greatest width	28	134
Width of interorbital area	13	67
Length of snout	15	67
Length of operculum	18	61
Length of maxillary	20	85
Length of upper jaw	25	99
Length of mandible	33	125
Distance from snout to orbit	17	68
Diameter of orbit	15	30

Measurements—Continued.

	Millimeters.	Millimeters.
Dorsal (spinous):		
Distance from snout	82	300
Length of base	45	165
Length of first spine	6	9
Length of second spine	11	28
Length of longest spine (4th)	30	82+
Length of last spine	8	15
Distance between dorsals	2	17
Dorsal (soft):		
Length of base	37	140
Length of antecedent spine	18	30
Length of longest ray	29	97
Length of last ray	13	46
Anal:		
Distance from snout	141	575
Length of base	29	91
Length of first spine	6	11
Length of second spine	12	21
Length of third spine	17	30
Length of first ray	28	87
Length of longest ray	28	87
Length of last ray	13	42
Caudal:		
Length of middle rays from origin	32	106
Length of external rays	44	132
Pectoral:		
Distance from snout	61	215
Length	33	119
Ventral:		
Distance from snout	73	285
Length	34	127
Dorsal	IX-I, 12	IX-I, 12
Anal	III, 11	III, 11
Pectoral	.....	18
Ventral	.....	I, 5
Number of scales in lateral line	68	69
Number of transverse rows above lateral line	10	10
Number of transverse rows from anal origin to lateral line	14	14
Number of gill-rakers	11	12

NOTES ON SOME GREENLAND FISHES.

By H. G. DRESEL,

Ensign, United States Navy.

During the months of July and August, 1883, while attached to the United States steamship Yantic which accompanied the Greely relief steamer Proteus to Greenland, I was enabled to obtain several species of the fishes inhabiting the waters of that region. I have increased the list by the examination of a collection of fishes obtained in Davis Straits by Mr. N. P. Scudder in the summer of 1879.

Sixteen species are mentioned in this paper, and comparatively full notes have been made upon them. Those of especial interest are *Icelus hamatus*, and *Salvelinus stagnalis*, full descriptions of which are given. They all form part of the National Museum collection, and the numbers accompanying them are those of the Museum Register.

Hippoglossus vulgaris Fleming.

Pleuronectes hippoglossus, LINNÉ, Syst. Nat., i, 1766, p. 456.

Hippoglossus vulgaris FLEMING, Brit. Anim., 1828, p. 197; GÜNTHER, Cat. Fish. Brit. Mus., iv, 1862, p. 403.

A skin, No. 28626, was obtained by Mr. N. P. Scudder in Davis Straits July 12, 1879. The fish was caught in a depth of 50 or 60 fathoms. The

color in spirits is a uniform dark brown, with numerous pale round spots and blotches on the body and the fins. Blind side white.

D. 102; A. 81; Gill-rakers, 8.

Towards the latter part of August the catch of the halibut began at Godhavn. The natives ventured far out into the bay in their kayaks to fish for them in deep water.

When a large fish is caught it is cut up into conveniently-sized pieces for stowage in the kayak. At one time a party of kayakers returning from Christianshaab, about 30 miles from Godhavn, brought with them pieces of halibut, to judge from which the fish itself must have weighed as much as 80 or 100 pounds.

Boreogadus saida (Lepech.) Bean.

Gadus saida LEPECHIN, Nov. Comm. Ac. Scien. Petrop., 1774, p. 512; GÜNTHER Cat. Fish. Brit. Mus., iv, 1862, p. 337; COLLETT, Den norske Nordh.-Exped., Fiske, 1880, p. 126, pl. iv, fig. 33.

Gadus fabricii RICHARDSON, F. B. A., 1836, p. 245; GÜNTHER, *op. cit.*, iv, 1862, p. 335.

Boreogadus saida BEAN, Bull. U. S. Nat. Mus., xv, p. 108.

34185. Two young specimens 110 to 122 millimeters long were picked up on the shore of the Waigatt channel, Disco Island, August 26, 1883.

In these small examples the lower jaw projects beyond the upper by 2 millimeters and the inequality of the caudal lobes mentioned by Dr. Theo. Gill, Proc. Acad. Nat. Sci. Phila., 1863, p. 233, is scarcely noticeable. The length of the head is contained $3\frac{5}{8}$ times, and the greatest depth of the body $6\frac{1}{2}$ times in the length to the caudal base. The eye is as long as the snout, $3\frac{3}{4}$ times in the length of the head. The maxilla reaches to below the middle of the eye, and is two-fifths as long as the head. The length of the mandible is contained $1\frac{3}{4}$ times, that of the interorbital width 4 times, that of the pectoral fin $1\frac{1}{8}$ times, and that of the ventral fin $1\frac{1}{2}$ times in the length of the head. The back is yellowish-brown, with a bluish tinge; the belly is silvery white. The head, body, and fins are minutely dotted with black. The lips, dorsal, pectoral, and caudal fins are black, and the tips of the anal fins are dusky.

D. 12, 15, 21; A. 16 to 20, 21; Gill-rakers 9 + 30.

Gadus morrhua Linn.

Gadus morrhua LINNÉ. Syst. Nat., i, 1766, p. 436; RICHARDSON, F. B. A, iii, 1836, p. 243; GÜNTHER, Cat. Fish. Brit. Mus., iv, 1862, p. 328.

28627. Davis Straits. N. P. Scudder. Length, 17 inches.

28628. Holsteinburg, Greenland. N. P. Scudder. Length, 11 inches.

Color, olive-brown above; belly, white. In the larger example from Davis Straits the sides are marbled with yellowish, and the fins are mottled with brown and yellow; lateral line, white; fins, dusky; dorsal and anal fins, edged with white.

Measurements.

[Species, *Gadus morrhua.*]

Current number of specimens	28627		28628.		22657*a*		22657*b*.	
Locality	Davis Straits.		Holsteinburg, Greenland.		Gloucester, Mass.		Gloucester, Mass.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length to caudal base	395	.....	250	.....	350	.....	330	.....
Length to end of middle caudal rays	427	.....	275	.....	384	.....	360	.....
Body:								
Least height of tail	21	5.3	15	6	21	6	19	5.8
Head:								
Greatest length	109	27.6	68	27.2	98	28	96	29
Width of interorbital area	30	7.6	17	6.8	24	7	23	7
Length of snout	37	9.4	22	8.8	32	9.1	31	9.5
Length of barbel	19	4.8	12	4.8	18	5.1	18	5.5
Length of maxilla	45	11.4	26	10.4	37	10 6	36	11
Length of mandible	53	13.4	33	13.2	46	13	46	14
Diameter of eye	19	4.8	14	5.6	18	5.2	18	5.5
Dorsal (first):								
Length of longest ray	53	13.4	35	14	52	15	50	15.1
Pectoral:								
Length	62	15.8	38	15.2	53	15.2	50	15.1
Ventral:								
Distance from snout	113	28.6	70	28	95	27.1	89	27
Length	53	13.4	38	15.2	45	13	47	14
Dorsal	15, 20, 19	.....	14, 19, 18	.....	14, 18, 19	.....	13, 18, 20	.....
Anal	20, 18	.....	21, 17	.....	19, 18	.....	20, 19	.....
Ventral	6	.....	6	.....	6	.....	6	.....

Gadus ogac Rich.

Gadus ogac RICHARDSON, Faun. Bor. Amer., iii, 1836, p. 246.
Gadus ovak REINHARDT, Vid. Selsk. Naturvid., Math. Afh., deel. vii, 1838.
Gadus ogat KRÖYER, Voy. en Scand. et Lap., pl. 19.

34184. Godhavn, Greenland. H. G. Dresel. Length, 190 millimeters.
34387. Godhavn, Greenland. H. G. Dresel. Length, 424 millimeters.
29096 (*a*). Greenland. Dr. Pavy. Length, 445 millimeters.
29096 (*b*). Greenland. Dr. Pavy. Length, 420 millimeters.
29096 (*c*). Greenland. Dr. Pavy. Length, 420 millimeters.

The specific distinction of *G. ogac* from the common cod, *G. morrhua*, is based on several important characters. Those least subject to variation are as follows: In *G. ogac* (1) the caudal peduncle is more slender, (2) the eye is comparatively larger, (3) the interorbital width is greater, (4) the barbel is longer, (5) the position of the ventral fins is more advanced, and (6) the pectoral fin is longer than in *G. morrhua*.

The color is dark, blackish-brown above, lighter below, with yellowish marblings. The tips of the dorsal, anal, and caudal fins are black. The ventrals and pectorals are dark-brown or black; a dusky spot on the axil. The barbel is black.

On comparing the following table of measurements of *G. ogac* with that of *G. morrhua* the distinctions above mentioned are brought out.

Measurements.

[Species, *Gadus ogac* Rich.]

Current number of specimen	29096*a*.		29096*b*.		21724.		34387.	
Locality	Greenland.		Greenland.		Greenland.		Godhavn, Greenland.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length to caudal base	400	.....	390	.....	325	.....	390	.....
Length to end of middle caudal rays	445	.....	420	.....	355	.....	423	.....
Body:								
Least height of tail	18	4½	18	4.7	14	4.4	19	4.9
Head:								
Greatest length	113	28¼	109	28	98	30	110	28.4
Width of interorbital area	35	8¾	33	8.5	29	9	33	8.5
Length of snout	36	9	33	8.5	30	9.2	36	9.3
Length of barbel	24	6	24	6.1	19	6	25	6.4
Length of maxilla	47	11¾	47	12	39	12	46	11.8
Length of mandible	59	14¾	60	15.4	47	14.5	49	15.1
Diameter of eye	23	5¾	22	5.7	19½	6	22	5.7
Dorsal (first):								
Length of longest ray	58	14½	53	13.6	52	16	55	14
Pectoral:								
Length	73	18½	75	19.2	59	18	66	17
Ventral:					80	24	97	25
Distance from snout	98	24½	89	23				
Length	51	12¾	59	15	48	14.8	55	14
Dorsal	15, 19, 17	.....	15, 18, 17	.....	14, 18, 20	.....	14, 20, 19	.....
Anal	22, 18	.....	22, 18	.....	21, 19	.....	20, 19	.....
Ventral	6	.....	6	.....	6	.....	6	.....

Gymnelis viridis (Fabr.) Reinhardt.

Ophidium viride FABRICIUS, Faun. Grœnl., 1780, p. 141.

Gymnelis viridis REINHARDT, Dansk. Vidensk. Selsk. Afh., vii, 1838, p. 131; GÜNTHER, Cat. Fish. Brit. Mus., iv, 1862, p. 323; KRÖYER, Poissons du Nord., Voy. en Scand. et Lap., pl. 15, a–f; COLLETT, Den norske Nordh.-Exped., Fiske, 1880, p. 123, pl. iv, fig. 32.

One small specimen, No. 28636, badly preserved, was obtained by Mr. Scudder in Davis Straits, July, 1879. Length, 100 millimeters.

In this small specimen the maxilla does not extend to the posterior margin of the eye, which is comparatively very large. Its diameter is longer than the distance from the tip of the snout to the orbit, and is contained 4 times in the length of the head. The length of the head is contained 7 times, and the greatest height of the body 12 times in the total length. The pectoral is one-half as long as the head.

D. ca 97; A. ca. 80.

Anarrhichas lupus Linn.

Anarrhichas lupus LINNÉ, Syst. Nat., i, 1766, p. 430; GÜNTHER, Cat. Fish. Brit. Mus., iii, 1861, p. 208.

Anarrhichas vomerinus STORER, Hist. Fish. Mass., 1867, p. 99, pl. xviii, fig. 1.

No. 28631. Davis Straits. N. P. Scudder. Length, 400 millimeters; D. 74; A. 45; P. 20.

This species is readily distinguished from other species of the same genus by the arrangement of the teeth, the band on the vomer extend-

ing much farther back than the short palatine bands, and by the presence of ten or twelve vertical black bands on the sides of the body.

In the example from Davis Straits there are 5 strong canines anteriorly in the upper jaw, and 4 in the lower. The vomer has 6 strong molars in an irregular double series, and each palatine is armed with 3 similar teeth. No lateral series in the upper jaw; the lower jaw with about 9 molars in a single series on each side, and 2 or 3 inner teeth anteriorly. The length of the upper jaw is slightly greater than one-half of the length of the head.

The length of the head is contained $4\frac{2}{5}$ times, and the greatest height of the body $5\frac{1}{2}$ times in the length to base of caudal. The eye is slightly greater than the snout and less than the interorbital width, its greatest diameter being contained $5\frac{1}{2}$ times in the length of the head. The longest dorsal ray is not quite one-half the length of the head. The pectoral is large: its length is contained $1\frac{2}{3}$ times in that of head.

D. 74; A. 45; P. 20.

Ammodytes dubius Reinh.

Ammodytes dubius Reinhardt, Dansk. Vidensk. Selsk. Afhand., vii, 1838, p. 132; Günther, Cat. Fish. Brit. Mus., iv, 1862, p. 387.

A number of examples of this species were obtained by Mr. N. P. Scudder, July, 1879. They were taken from the stomach of a halibut caught in Davis Straits, near Holsteinburg, Greenland. The species is readily distinguished from *A. americanus* by the radial formula, the number of lateral folds, and the proportional length of the head.

28633 (*a*). Davis Straits. N. P. Scudder. D. 66; A. 32; lateral folds, 149. Length, 190 millimeters.

28633 (*b*). Davis Straits. N. P. Scudder. D. 65; A. 34; lateral folds ca., 150. Length, 192 millimeters.

28633 (*c*). Davis Straits. N. P. Scudder. D. 65; A. 33; lateral folds ca., 145. Length, 180 millimeters.

28633 (*d*). Davis Straits. N. P. Scudder. D. 67; A. 36; lateral folds, 152. Length, 202 millimeters.

28633 (*e*). Davis Straits. N. P. Scudder. D. 66; A. 33; lateral folds ca., 145. Length, 190 millimeters.

In all these examples the dorsal fin begins over the posterior third of the pectoral fin, which is equal in length to the postorbital part of the head and to the greatest height of the body. The length of the head is contained $5\frac{1}{2}$ to 6 times in the length to the caudal base. The diameter of the eye is one-half the length of the snout, which is about one-third the length of the head.

A young example of this species obtained in Godhavn Harbor, Disco Island, August, 1883, resembles *A. americanus* in the number of fin rays and the proportional length of the head, yet this may be owing to the incomplete development in the young fish. A distinctive feature is the number of body folds. As many as 155 can be plainly counted,

while in the largest specimen of *A. americanus* examined the number does not exceed 130. The pectoral fin also is larger.

The color is olivaceous above, lighter below, a bluish-silvery stripe on the sides. The head is brownish, with a dark-brown blotch on the preorbital, and a black streak across the opercle on line with the eye. The mandibular symphysis is black, and the opercular margin is punctulated with black. There is a blackish blotch on the caudal penduncle; caudal fin and upper half of pectoral fin dusky.

Stichæus punctatus (Fabr.) Kröyer.

Blennius punctatus FABRICIUS, Faun. Grœnl., 1780, p. 153.

Stichæus punctatus KRÖYER, Nat. Tids. I, 377, and Plates Poissons du Nord, Voy. en Scand. et Lap., pl. 20, fig. 2, a–e; GÜNTHER, Cat. Fish, Brit. Mus., iii, 1861, p. 283.

Two examples of this species, 126 and 127 millimeters in length, were obtained with a boat dredge at Godhavn, Disco Island, July 15, 1883.

The body is moderately elongate, compressed, and covered with small scales. The lateral line is single, well up on the back, extending slightly beyond the middle of the dorsal fin. The gill-openings are continued forward below, the membranes united to the narrow isthmus. The snout is subconical, as long as the eye, which is large and prominent, its greatest diameter being contained $4\frac{1}{2}$ times in the length of the head. The maxilla reaches slightly beyond the vertical through the anterior margin of the eye, and its length is contained 4 times in that of the head. The length of the mandible is three-sevenths of that of the head. The width of the interorbital space is one-half of the greatest diameter of the eye. The dorsal fin is long, of spines only; the anal is shorter, with a short antecedent spine. The caudal fin is rounded. The pectoral is well developed, not quite as long as the head. The ventral fin is composed of three rays, its length being two-fifths of that of the head. The length of the head is contained $4\frac{1}{2}$ times, and the greatest depth of the body $7\frac{3}{4}$ times in the total length of the caudal base.

The color is a bright scarlet; the head is marked below with 5 or 6 brown reticulations, and with a brown streak from the snout to the eye. The vertical fins and the pectorals are marked with brown bands. The dorsal fin has 5 large round black spots, each with a white band near its posterior margin. These spots are placed at equal intervals on the fin.

D. XLIX; A. I, 35; P. 16; V. 3; B. 6.

Eumicrotremus spinosus (Müll.) Gill.

Cyclopterus spinosus MÜLLER, Prodr. Zool. Dan., ix, 1877; FABRICIUS, Faun. Grœnl., 1780, p. 134; KRÖYER, Poissons du Nord, Voy. en Scand. et Lap., pl. 4, fig. 2, a–c.; GÜNTHER, Cat. Fish, Brit. Mus., iii, 1861, p. 157.

Eumicrotremus spinosus GILL, Proc. Acad. Nat. Sci. Phila., 1864, p. 190; COLLETT, Zool. norske Nordh.-Exped., Fiske, 1880, p. 47, pl. ii, fig. 13.

28632. A single specimen, 90 millimeters long, was obtained by Mr. Scudder in Davis Straits, July, 1879. It was taken from the stomach of a halibut.

The head and body suborbicular; the body posteriorly is abruptly compressed. The mouth is moderate, the jaws with narrow bands of villiform teeth. The maxilla reaches to below the anterior margin of the eye, its length being contained $2\frac{2}{3}$ times in that of the head. The gill opening is small, as long as the diameter of the eye, which is contained 3 times in the length of the head. The disc is about as long as it is broad, two-thirds of the length of the head. The interorbital width is greater than one-half the length of the head, and not quite twice the diameter of the eye. Length of head contained 3 times, greatest height of body 2 times, in total length. The body is covered with conical plates of various sizes, those of the pectoral region being the largest, about as large as the eye. The plates are studded with small tubercles, and the larger ones have the centers elevated and pointed.

Color, in spirits, light brown, with traces of punctulations on the skin between the plates.

D. VII, 11; A. ca. 10.

Cyclopterus lumpus L.

Cyclopterus lumpus LINNÉ, i, 1766, p. 414; GÜNTHER, Cat. Fish, Brit. Mus., iii, 1861, p. 155.

No. 28637 is a small example of this species obtained by Mr. Scudder in Davis Straits. It is only 31 millimeters long. The spinous dorsal is comparatively high and is not enveloped in thick skin as in the adults. The abdominal tubercles are the most developed. The gill-opening is as long as the base of the anal fin, which is as long as the disc. D. iv, 10; A. 10.

Only one specimen, badly mutilated by the Esquimaux dogs, was seen at Godhavn. The color was a bright olive green, with the belly white. These fish are seldom caught in this harbor after May, during which month they are very abundant.

Cottus scorpius L., subsp. grœnlandicus C. & V.

Cottus grönlandicus CUV. & VAL., Hist. Nat. Poiss., IV, 1829, p. 185; GÜNTHER, Cat. Fish, Brit. Mus., II, 1860, p. 161.

Cottus scorpius subsp. *grönlandicus*, BEAN, Bull. U. S. Nat. Mus., XV., p. 118.

34386 (*a*). ♂ Godhavn, Greenland. H. G. Dresel. D. X, 17; A. 14. Length, 268 millimeters. Interorbital width equal to diameter of eye. Longest dorsal spine contained 6 times, and longest dorsal ray 5 times, in length to caudal base.

34386 (*b*). ♀ Godhavn, Greenland. H. G. Dresel. D. X, 16; A. 13. Length 254 millimeters. Interorbital width is equal to diameter of eye. Longest dorsal spine contained 8 times, longest dorsal ray 6 times, in the total length to caudal base.

34386 (*c*). ♂ Godhavn, Greenland. H. G. Dresel. D. XI, 16; A. 12. Length, 245 millimeters. Interorbital width contained $1\frac{1}{6}$ times in diameter of eye. Longest dorsal spine contained $6\frac{1}{2}$ times, longest dorsal ray 6 times, in the length to caudal base.

34386 (*d*). ♂ Godhavn, Greenland. H. G. Dresel. D. XI, 17; A. 14. Length, 252 millimeters. Interorbital width equals diameter of eye. Longest dorsal spine contained 7 times, and longest dorsal ray 6 times, in total length to caudal base.

34386 (*e*). ♂ Godhavn, Greenland. H. G. Dresel. D. X, 16; A. 13. Length, 161 millimeters. Interorbital width contained $1\frac{1}{2}$ times in diameter of eye. Longest dorsal spine contained $5\frac{3}{4}$ times, and longest dorsal ray $5\frac{1}{5}$ times, in total length to caudal base.

In all the examples examined the length of the head is contained $2\frac{1}{2}$ to $2\frac{3}{4}$ times in the total length, and the greatest height of the body about $4\frac{1}{2}$ times. The greatest diameter of the eye is one-sixth of the length of the head.

The subspecies *grœnlandicus* differs from *Cottus scorpius* (1) in its larger size; (2) in the greater interorbital width which in *C. scorpius* seldom exceeds five-eighths of the longest diameter of the eye; and (3) in the higher spinous dorsal, the longest dorsal spine in *C. grœnlandicus* being contained 5 to 6 times in the total length to the caudal base, while in *C. scorpius* it is contained as much as 7 to 8 times in the same length.

The natives catch these sculpins in large numbers for their food supply. They use 6 or 7 fathoms of line with a 3- or 4-pronged hook and no bait.

Gymnacanthus tricuspis (Reinh). Gill.

Cottus tricuspis REINHARDT, Vidensk. Selsk. Nat. Math. Afh., V, p. LII; GÜNTHER, Cat. Fish, Brit. Mus., II, 1860, p. 168.

Phobetor tricuspis, KRÖYER, Natur. Tidskr. I, 1844, p. 263.

Gymnacanthus tricuspis, GILL, Cat. Fish. E. Coast N. A., 1873, p. 22.

Gymnacanthus pistilliger, COLLETT, Den norske Nordh.-Exped., Fiske, 1880, p. 26.

28629 (*a*). Holsteinburg, Greenland. N. P. Scudder. ♂ D. XII,16; A. 18.

28629 (*b*). Holsteinburg, Greenland. N. P. Scudder. ♂ D. XII, 16; A. 17.

28629 (*c*). Holsteinburg, Greenland. N. P. Scudder. ♀ D. XI, 16; A. 17.

34388. Godhavn, Greenland. H. G. Dresel. ♂ D. XI, 15; A. 17.

These examples, as well as those collected in Cumberland Gulf and Disco Bay by Mr. Kumlien in the summer of 1878, all differ decidedly from the west coast specimens in the museum collection.

Dr. T. H. Bean having examined Pallas's type of *Cottus pistilliger* from Kamtschatka and compared numerous specimens from the Pacific and Atlantic Oceans, inclines to the belief that the Greenland form of *Gymnacanthus* does not occur in the Pacific. It is best, therefore, to retain Reinhardt's name *tricuspis* for the Atlantic species.

The skin is smooth with a patch of rough, scale-like tubercles in the pectoral region of the body, partly concealed by the pectoral fin. The lateral line, with 38 to 42 tubes, is curved under the last dorsal ray.

The mouth is moderate; the maxilla reaches to below the middle of the eye, and its length is one-half of the greatest height of the body. The eye is large, its greatest diameter being contained four times in the length of the head. The interorbital area is narrow, deeply concave; its greatest width is one-third of the diameter of the eye. The nasal spines are small. The upper preopercular spine has 3 small spinous processes; its greatest length is about two-thirds of the diameter of the eye. In the male example from Godhavn there is a patch of 8 or 9 rough plates between the occipital ridges. These are entirely wanting in the two male examples from Holsteinburg Harbor, while in the female the top of the head, the nape, and the upper parts of the opercles are thickly covered with these plates. Another noticeable difference between the sexes is in the height of the dorsal fins and in the length of the ventrals. The dorsal fin in the male is comparatively much higher than in the female, the longest dorsal spine in the former being as long as the head, while in the latter it is only three-fifths of the length of the head. The ventral in the male reaches beyond the origin of the anal fin, its length being one-third of the total length to the base of the caudal fin, while in the female the ventral does not reach the vent, its length being one-fourth of the total length to caudal base. The pectoral fin is about as long as the head, and the middle pectoral rays are papillose on their inner edges. The ventral rays are exserted. The color is dark brown above. The thoracic region is dusky, with irregular large yellow spots. On the side of the tail is a series of four or five white spots smaller than the eye. The chin is banded with yellow and brown. The spinous dorsal is black, with two rows of white spots on the basal half of the fin. The soft dorsal is black, with five or six broad oblique white bands. Pectoral yellowish, with four or five transverse series of black spots. Ventrals spotted with black and white; caudal fin dusky; anal colorless.

D. XII, 15–16; A. 17–18; P. 19; V. I, 3; Pyloric cœca 6.

Icelus hamatus Kröyer.

Icelus hamatus KRÖYER, Nat. Tidsskr., I, 1844, p. 253, and Poissons du Nord, Voy. en Scan. et Lap., pl. I, fig .2, a–g; GÜNTHER, Cat. Fish, Brit. Mus., II, 1862, p. 172; COLLETT, Den norske Nordh.-Exped., Fiske, 1880, p. 34, pl. I, fig. 8.

A fine example, 6 inches long, of this species, No. 28630 in the National Museum collection, was obtained in Davis Straits by Mr. N. P. Scudder. Owing to the scarcity of this species in collections and the good condition of the example under consideration I have thought it best to give a full description.

The body is fusiform, with the abdominal outline nearly straight; the greatest height of the body at the origin of the spinous dorsal fin is one-fourth of the total length to the caudal base. The caudal peduncle is slender, the least height of the tail being only one-fifth of the greatest height of the body. The head is large and naked, its length being contained $2\frac{2}{3}$ times in the total length to caudal base. The nu-

chal region has a cross ridge, in front of which is a quadrate depression. The occiput is armed with a pair of blunt spines, the length of a spine being two-fifths of the greatest diameter of the eye. At the base of each spine is a blunt protuberance. The preopercle is armed with four spines, the upper of which is the longest, bifurcate, and hooked upwards; the one next below is slightly bent upward, and the remaining two are directed downward and forward. The suborbital stay is prominent. The eye is large, placed next to the upper profile of the head; its greatest diameter is equal to the length of the snout, and is one-fourth of the length of the head. The interorbital area is very narrow and concave, its width being one-fourth of the greatest diameter of the eye. The maxilla extends slightly beyond the vertical through the posterior margin of the eye, and its length is contained 2 times in the length of the head. The teeth are in villiform bands on the jaws, vomer, and palatines. The body is chiefly naked, with a dorsal series of 23 bony, scale-like plates beginning opposite the sixth dorsal spine and extending upon the upper side of the caudal peduncle; a second series of 41 similar plates along the lateral line. There are 2 or 3 of these plates on either side of the nape, behind the occipital spines, and a patch of 4 or 5 plates below the lateral line in the pectoral region.

The spinous dorsal begins over the tip of the opercular flap, and the length of its base is equal to that of the upper jaw. It is composed of 9 slender and flexible spines, the longest spine being as long as the distance from the tip of the snout to the orbit. The soft dorsal, of 20 rays, begins halfway between the tip of the snout and the base of the caudal fin. Its base is nearly as long as the head, and the longest ray is one-third the length of its base. The origin of the anal fin is under the third dorsal ray; the length of its base is equal to the greatest height of the body, and the longest ray is as long as the longest dorsal spine. The caudal fin is rounded, the middle rays being as long as the maxilla. The length of the pectoral base is two-fifths of that of the head, and the longest pectoral ray is equal in length to the greatest height of the body. The ventral fin is composed of 1 spine and 3 rays, its length being two-fifths of that of head.

There are no gill-rakers, but the anterior gill-arch bears 9 or 10 low tubercles.

Color in spirits, a light olive-brown above; yellowish below; belly white. A large dark-brown blotch, marked with white, extends from the base of the spinous dorsal down upon the side to the base of the pectoral fin, being darkest just behind the opercular flap. A second similar but narrower blotch on the back from the seventh to the tenth dorsal rays extends obliquely down and forward to below the lateral line. A third faint blotch on the back at the end of the soft dorsal. In addition there are numerous smaller spots and blotches along the lateral line, and a triangular spot on the caudal peduncle at the caudal base. Cheeks brown, marbled with yellow. Dorsal, caudal, and pec-

toral fins with narrow black transverse bands. A dark spot on the pectoral fin near its base. Anal and ventrals colorless.

D. IX, 20; A. 16; P. 18; V. I, 3; l. lat. 41.

Table of measurements.

[Species: *Icelus hamatus* Kröyer.]

Current number of specimen	28630.
Locality	Davis Straits.

	Millimeters.	100ths of length.
Extreme length to end of middle caudal rays	157	
Length to origin of middle caudal rays	134	
Body:		
Greatest height	35	26
Greatest width	27	20
Height at ventrals	34	25.4
Least height of tail	7	5.3
Length of caudal peduncle (from end of dorsal)	21	15.8
Head:		
Greatest length to end of opercular flap	50	37.3
Distance from snout to nape	39	29
Greatest width	28	21
Width of interorbital area	3	2¼
Length of snout	13	9.7
Length of longest preopercular spine	5	3.7
Length of maxilla	23	17.2
Length of upper jaw	26	19.4
Length of mandible	28	21
Distance from snout to orbit	15	11.2
Diameter of orbit	13	9.7
Dorsal (spinous):		
Distance from snout	49	36.6
Length of base	26	19.4
Length of longest spine (3d)	15	11.2
Length of first spine	13	9.7
Length of second spine	14	10.6
Length of last spine	2	1½
Dorsal (soft):		
Length of base	48	36
Length of longest ray	16	9
Length of last ray	7	5.3
Anal:		
Distance from snout	74	55.2
Length of base	35	26
Length of first ray	7	5.3
Length of longest ray	15	11.2
Length of last ray	6	4.5
Caudal:		
Length of middle rays	23	17.2
Length of external rays	16	9
Pectoral:		
Distance from snout	45	34
Length (of longest ray.)	35	26
Ventral:		
Distance from snout	39	29
Length	21	15.8
Branchiostegals	VI	
Dorsal	IX-20	
Anal	16	
Caudal	14	
Pectoral	18	
Ventral	I, 3	
Number of plates in lateral line	41	

Sebastes marinus (L.) Lütken.

Perca marina, LINNÉ. Syst. Nat., i, 1766, p. 483.

Perca norwegcia, MÜLLER, Zool. Dan., p. 46.

Sebastes norwegicus, CUV. & VAL., Hist. Nat. Poiss, iv, 1829, p. 327, pl. 87; GÜNTHER, Cat. Fish Brit. Mus., ii, 1860, p. 95.

Sebastes marinus, COLLETT, Den norske Nordh.-Exped., Fiske, 1880, p. 15 pl. II, figs. 3–4.

28635. juv. Two very small specimens were obtained in Davis Straits by Mr. N. P. Scudder in the summer of 1879. The color in spirits is a

pale yellowish-brown with three or four large brown blotches on the back extending partly on the dorsal fin.

D. XIII, 14; A. III, 7.

Mallotus villosus (Müll.) Cuv.

Clupea villosa, MÜLLER, Prod. Zool. Dan., 1777, p. 245.
Mallotus villosus, GÜNTHER, Cat. Fish. Brit. Mus., vi, 1866, p. 170; RICHARDSON, F. B. A., iii, 1836, p. 187.

34385. Eight examples of this species, 7 males and 1 female, were obtained at Godhavn, Greenland. The males are all conspicuous by the presence of the large lanceolate lateral scales, and the compressed base of the anal fin. The length of the head is contained $4\frac{1}{2}$ to $4\frac{2}{3}$ times the depth, 6 to $7\frac{1}{2}$ times in the total length to the origin of the caudal fin. The snout is contained $3\frac{1}{2}$ times, and the greatest diameter of the eye 4 to $4\frac{1}{2}$ times in the length of the head.

D. 13–14; A. 20–22; P. 20.

The capelin are caught in numbers by the natives and dried, forming part of the winter's supply of food.

8. Salvelinus stagnalis (Fabr.) Gill & Jor.

Salmo stagnalis FABRICIUS, Fauna Grœnlandica, 1780, p. 175.
Salmo alipes RICHARDSON, Fauna Bor. America, 1836, p. 169, pl. 81 and 86, fig. 1.
Salmo alipes GÜNTHER, Cat. Fish. Brit. Mus., vi, 1866, p. 149.
Salvelinus stagnalis JORDAN & GILBERT, Synop. Fish. N. A., 1883, p. 321.

34384. In July, 1883, three specimens of the genus *Salvelinus*, two males and one female, were obtained from the native Esquimaux at the settlement of Godhavn, Disco Island, in Western Greenland. The fish were caught at the mouth of a mountain stream emptying into the sea near the settlement. They vary in total length from 15 to 17 inches.

Although it is doubtful whether this species is the *Salmo stagnalis* of Fabricius, yet it agrees partly with his description and very closely with Dr. Richardson's description of *Salmo alipes*, which is probably identical with *S. stagnalis*. It differs from *S. carpio* Fabricius in being more elongate and in the absence of the black quadrate spots mentioned in his description.

The examples under consideration were compared with notes on the types of *Salmo naresi* Günther, made by Dr. Tarleton H. Bean, in the British Museum, and the most prominent points of difference noticed were the following: In *S. naresi* (1) the eye is very much larger, (2) the snout is much shorter, (3) the maxilla does not extend beyond the posterior margin of the eye, (4) the gill-rakers are longer and more numerous. In other respects the resemblance between the two species is close.

Salmo stagnalis is described in Fauna Grœnlandica, 1780, p. 175, as follows:

"A salmon of a brownish color above, pale below; body subterete, the upper jaw the longer. The Greenland name is *Ekallukak*.

"*Description.*—B. 12; D. 14; P. 14; V. 10; A. 10; C. 21. Length, 17½ inches. This is much larger than the preceding species [*S. alpinus*]. The body is somewhat rounded and elongate, becoming very slender behind the vent towards the extremity of the tail, where it expands slightly above and below into the caudal fin, of which the base is more compressed. Head large, oblong, ovate with flat sides, crown prominent, snout somewhat pointed; nostrils two on each side in front of eyes, their openings contiguous, wide; the anterior is the smaller, circular, the posterior larger, almost triangular; opercles large, smooth, and double, as in the preceding species; upper jaw longer than the lower; the snout projecting by 2 lines. Both jaws with toothed margins; the upper is also toothed on the posterior part which extends beyond the lower jaw. Palate with two rows of closely-placed teeth, to which is added a third but short intermediate row anteriorly; tongue long, somewhat obtuse, the margins with about twenty or more teeth. Teeth all strong, curved, and sharp. The first dorsal begins slightly in advance of the ventrals; rays 2 inches long and almost equal in length; the posterior adipose fin placed behind the anal, short, falcate, with rounded apex. The pectoral fins are slightly longer than the dorsal, pointed; the three upper rays of increased length, the remaining ones gradually becoming shorter. Ventrals similar to the pectorals, but slightly shorter, placed half-way between the gills and the adipose fin. Anal fin terminates opposite the adipose fin; shorter than the others, the rays becoming gradually shorter posteriorly; caudal fin large, subbifurcate. Color above and of dorsal fins brownish-black; sides pale, white below. All the lower fins grayish-white, with white bases. Flesh pale. I could observe no spots.

This second specimen was in a dried state; it was not possible to obtain a live example."

The specimens under examination have the body elongate, not much compressed, caudal peduncle slender. The head is moderate, slightly raised mesially; the interorbital space broad, its width contained about 3 times in the length of the head; the snout is pointed, its length contained about 4 times in that of the head. The jaws are subequal; the maxillary, long and narrow, extends beyond the vertical through posterior margin of eye, and seems to be somewhat shorter in the female than in the males. Eye rather small, its diameter being contained 6¾ to 7 times in the length of the head. The nostrils are close together in the horizontal through the upper margin of the eye and at a distance from the center of the pupil equal to their distance from the tip of the snout. The anterior nostril with a circular flap, the posterior triangular.

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Teeth in a single series on the jaws, palatines, and on the margin of the tongue; 3 or 4 strong teeth on the chevron of the vomer. The hyoid teeth are well developed. The preorbital is narrow, its width being about one-fourth of the diameter of the eye, with a row of conspicuous pores. Preopercle with a lower limb. The broad opercles and preopercles are conspicuously striated, and the postorbitals and suboperculum have strong concentric striæ. The gill-rakers are short and wide, the longest being one-half as long as the eye; there are 9 above and 14 to 15 below the angle of the anterior arch. The dorsal fin is about as high as long, the longest ray being contained $1\frac{3}{4}$ times in the length of the head. The anal fin is short, its longest ray slightly longer than the base of the fin is contained 2 times in the length of the head. The adipose fin is placed above the last anal rays; it is of moderate length, falcate, its height being about twice its width. The pectoral fin is placed low; its length is less than one-half the distance of its origin from that of the ventral. The ventral is inserted under the fourth dorsal ray and reaches half-way to the anal origin. The length of the ventral appendage is two-fifths of that of the fin. The caudal fin is large, slightly forked, the external rays not quite twice as long as the middle rays. All the fins are shorter in the female than in the male.

The length of the head is contained $4\frac{3}{5}$ to 5 times, and the greatest height of the body $5\frac{1}{4}$ to 6 times in the total length from the tip of the snout to the end of the scales. The diameter of the eye is contained 2 times in the distance from the orbit to the tip of the snout, and $2\frac{1}{3}$ times in the width of the interorbital area. The length of the snout is one-fourth, that of the maxilla two-fifths, that of the pectoral two-thirds, and that of the ventral about one-half of the length of the head.

The scales are small. There are about 235 in a longitudinal series above the lateral line, which is composed of about 123 larger tube-bearing scales. There are about 34 scales in a transverse series above the lateral line, and 26 to 30 below.

Radial formula.—D. iii—iv, 11; A. ii, 10; P. 14; V. i, 9; B. 11; gill-rakers 9 + 14 to 15; pyloric cœca, 30 to 35.

The color is dark green on the head and the upper part of the body, with lighter wide irregular green streaks, differing in width, length, and position in different individuals; silvery below. The sides are everywhere covered with pale pink spots, the largest not as large as the eye. These spots almost disappear in the alcoholic specimens. The dorsal fin is bluish-green, somewhat lighter towards its base. The caudal lobes are dusky near the margins. The other fins are reddish or pink. The flesh is pale pink.

Table of measurements.

[Species, *Salvelinas stagnalis* (Fabr.) Gill.]

Current number of specimen	34384 (5) ♂		38384 (6)		34384 (7)	
Locality	Disco Island, Greenland.		Disco Island, Greenland.		Disco Island, Greenland.	
	Millimeters.	100ths of length.	Millimeters.	100ths of length.	Millimeters.	100ths of length.
Extreme length	389	.....	398	.....	429	.....
Length to end of scales	353	.....	372	.....	400	.....
Body:						
Greatest height	65	18.5	71	19.1	68	17
Greatest width	31	9	39	10.5	38	9.5
Height at ventrals	62	17⅔	68	18.3	65	16¼
Least height of tail	24	6.9	26	7	24	6
Length of caudal peduncle	57	16¼	62	16.6	58	14.6
Head:						
Greatest length	74	21	75	20½	87	21.8
Longest gill-raker	4½	1.5	6	1.6	6	1.5
Greatest width	30	8.5	36	9.7	40	10
Width of interorbital area	25	7	26	7	29+	7.3
Length of snout	19	5.5	19	5.2	22	5.5
Length of operculum	22	6.3	24	6.5	32	8
Length of maxillary	30	8.5	28	7.6	34½	8.6
Length of upper jaw	38	10.8	36	9.7	44	11
Length of mandible	45	12.7	45	12.3	54	13.5
Distance from snout to orbit	21½	6	22	5.8	25	6¼
Diameter of eye	11	3.1	11½	3.1	12½	3.1
Diameter of iris	9	2.5	9	2.4	9½	2.4
Dorsal:						
Distance from snout	155	44	174	46.8	180	45
Length of base	44	12.6	42	11.5	44	11
Length of longest ray	44	12.6	44	12	49	12¼
Length of last ray	21	6	18	4.8	22	5.5
Adipose fin:						
Distance from origin of rayed dorsal	122	34	139	37	132	33
Length of base	9	2.5	6	1.6	9	2
Length of posterior margin	13	3⅔	9	2.4	12½	3.1
Anal:						
Distance from snout	257	73	268	72	292	73
Length of base	35	10	33	9	37	9¼
Length of longest ray	37	10.6	38	10.3	42	10.5
Length of last ray	14	4	13½	3.7	15½	3.8
Caudal:						
Length of middle rays from end of scales	27	7.6	26	7	29	7.3
Length of external rays from end of scales	51	14.5	53	14.5	55	13.8
Pectoral:						
Distance from snout	73	20.7	74	20	83	20.8
Length	50	14.2	47	12.7	54	13.5
Ventral:						
Distance from snout	184	52.3	183	49.2	198	49.5
Length	43	12¼	41	11	46	11.5
Length of appendage	17	4.8	18	4.8	18½	4.6
Branchiostegals	11, 10	.....	11	.....	11	.....
Dorsal	iv, 11	.....	iii, 11	.....	iii, 11	.....
Anal	ii, 10	.....	ii, 10	.....	ii, 10	.....
Pectoral	13	.....	14	.....	14	.....
Ventral	i, 8	.....	i, 9	.....	i, 9	.....
Number of scales in lateral line tube bearing	ca. 120	.....	ca. 123	.....	ca. 128	.....
Number of scales in longitudinal series	ca. 235	.....	ca. 235	.....	ca. 235	.....
Number of transverse rows above lateral line	ca. 34	.....	ca. 35	.....	ca. 34	.....
Number of transverse rows below lateral line	ca. 26	.....	ca. 30	.....	ca. 26	.....
Number of gill-rakers	9+15	.....	9+14	.....	9+14	.....
Number of cæcal appendages	30	.....	35	.....	34	.....

DESCRIPTION OF A NEW SPECIES OF FIELD-SPARROW FROM NEW MEXICO.

By ROBERT RIDGWAY.

Spizella wortheni, sp. nov.

SP. CH.—Resembling *S. pusilla*, but altogether less rufous, with the black streaks of the dorsum broader, the rufous auricular streak and rufous spot on sides of the breast wholly absent, the wing bands much less distinct, the eyelids distinctly white, and the bill much more slender.

Adult ♂ (type No. 98512, U. S. Nat. Mus., Silver City, New Mexico, June 16, 1884): Pileum light fulvous-brown, tinged with rufous, indistinctly streaked with dusky, and without trace of lighter median stripe. Back and scapulars light fulvous-brown, broadly, and rather sharply streaked with black. Rump and upper tail-coverts brownish ash-gray, the latter with rather distinct medial streaks of dusky. Wings dusky, all the feathers edged with light grayish-brown; middle coverts tipped with buffy-whitish, but terminal light margins of the greater coverts scarcely more distinct than the lateral edgings, and not forming an appreciable band. Entire side of head ash-gray, including the anterior part of the forehead and whole superciliary and supra-auricular region; no trace of a rufous or brown post-ocular streak. Eyelids white, forming a rather distinct orbital ring. Chin and throat grayish-white; remaining lower parts brownish-white, deeper on the jugulum, especially laterally, where, however, the color does not incline to rufous; crissum and lining of wing nearly pure white. Bill cinnamon-brown; legs and feet horn-brown. Wing 2.70; tail (somewhat worn) 2.50; culmen from extreme base .40; bill from nostril .25; depth at base .18; tarsus .70; middle toe .45.

While unquestionably most nearly related to *S. pusilla*, this species is also allied to *S. atrigularis;* in fact, these three species form a well-marked group of the genus, distinguished by certain characters which they possess in common, and which separate them from two other groups, including *S. monticola* on the one hand, and *S. socialis*, *S. pallida*, and *S. breweri* on the other. The differences from *S. pusilla* have been pointed out above. With *S. atrigularis*, *S. wortheni* agrees in the exactly similar coloration of the upper parts, excepting only the head and neck, and in the similarly small, slender bill. *S. atrigularis*, however, has the head entirely uniform ash-gray (excepting the adult ♂, which has the feathers round the base of the bill, the chin, and throat black) and the lower parts also gray, except the abdomen and crissum, which are white. The latter occurs in the same region with *S. wortheni;* in fact, specimens of the two were contained in the same collection.

I take great pleasure in dedicating this new species to Mr. Charles K. Worthen, of Warsaw, Ill., who has by his personal efforts done much to develop the ornithology of New Mexico, and who has kindly presented the type specimen to the National Museum.

NOTES ON FISHES COLLECTED AT GUAYMAS, MEXICO, BY MR. H. F. EMERIC, WITH A DESCRIPTION OF *Gobiosoma histrio*, A NEW SPECIES.

By DAVID S. JORDAN.

The National Museum has lately received from Mr. H. F. Emeric a bottle containing four species of fishes from Guaymas, Mexico. Two of these species are especially interesting, one being new to science, and the other hitherto of unknown habitat and unrepresented in the U. S. National Museum.

1. **Myrophis vafer**, Jordan & Gilbert (35145).

One large specimen, agreeing closely with the original description. Head 9 in length.

2. **Gobius soporator**, C. & V.

One small specimen.

3. **Gobiosoma histrio**, sp. nov. (35147).

Head, 3¼ in length (4 with caudal); depth, 5⅓; dorsal rays, VII–13; anal, 12; length of type, 2 inches.

Body not much elongate, depressed posteriorly; the snout low, little obtuse; mouth large, rather oblique, the maxillary reaching to below the front of the small eye, which is 4⅔ in head; maxillary 2⅔ in head; teeth rather small, in a moderate band below, in one or two series above, the outer teeth enlarged.

Body everywhere smooth and scaleless. Fins all low. Longest dorsal spine about two-fifths length of head. Caudal 1¼ in head, pectoral 1⅕.

Color, in spirits, blackish, with six white cross-bands sharply defined, the first at front of spinous dorsal, the second a little behind middle of dorsal, the third between the dorsal fins, the fourth and fifth below second dorsal, the sixth fainter, on the caudal peduncle, second and third bands slightly broadened and turned backward above, below the dorsal. All these bands are about as broad as eye, and all reach the belly, but do not pass around it. Lower parts everywhere finely punctulate. Top and sides of head freckled with paler. A distinct blackish lunate blotch on base of pectoral; a much fainter one at base of caudal. Fins plain, except that the pale cross-bands from the body extend on the dorsal. A dusky longitudinal blotch on upper part of cheeks.

This species is very different from *G. ios* Jor. & Gilb., *G. longipinne* Steindachner, and *G. zosterurum* Jor. & Gilb., the only species of the genus yet known from the Pacific coast of North America.

4. **Parophrys leopardinus**, (Günther). (35146).

(*Rhomboidichthys leopardinus*, Günther, Cat. Fishes, iv, 434.)

A specimen 2⅝ inches long, not in very good condition. It agrees fully with Dr. Günther's description, above cited. The original type

of the species came from the Haslar collection, its habitat being unknown.

Head, $3\frac{3}{4}$ in length; depth, $1\frac{3}{4}$. D. circa, 88 (injured); A. 64 (62 to 66). Lat. l. about 80. Mouth very small, the maxillary $3\frac{4}{5}$ in head. Interorbital space concave, rather broad, its width $3\frac{1}{2}$ in head. Eyes large, the lower considerably before the upper; its diameter $3\frac{1}{2}$ in head.

Lateral line with a short sharp curve anteriorly. Gill-rakers very small. Anterior rays of dorsal not elevated. Left pectoral not produced, little longer than right, $1\frac{1}{4}$ in head.

Coloration highly variegated with different shades of gray, the pale blotches rounded, very irregular in size and position. No distinct black spots along the lateral line. A large whitish cloud between the eyes.

Blind side pale, scaled like the eyed side.

U. S. NATIONAL MUSEUM, *July* 28, 1884.

A REVIEW OF THE AMERICAN SPECIES OF MARINE MUGILIDÆ.

By DAVID S. JORDAN and JOSEPH SWAIN.

In the present paper is given the synonymy of the species of *Mugilidæ* known to inhabit the salt and brackish waters of America, with analytical keys by which the species and genera may be distinguished. Five of the species of *Mugil* are also described in full.

The marine *Mugilidæ* of America fall naturally into three genera, which may be thus distinguished:

a. Anal spines three; teeth ciliiform, flexible; stomach muscular, gizzard-like.
b. Cleft of mouth chiefly anterior; lower jaw broad; cilia in one or few series. MUGIL, 1.
bb. Cleft of mouth lateral; lower jaw narrow; cilia in very many series, pavement-like; upper lip very thick; no adipose eyelid; vertical fins scaly. CHÆNOMUGIL, 2.
aa. Anal spines two, the first soft ray simple, but distinctly articulate; teeth distinct, scarcely ciliiform; lips thin; no adipose eyelid; vertical fins, not scaly; stomach muscular, gizzard-like ..... QUERIMANA, 3.

Genus 1.—MUGIL.

Mugil, (Artedi, Genera, 32) Linnæus, Syst. Nat., ed. x, 1758, 316 (*cephalus*).

Liza, Jordan & Swain (subgenus nova) (*capito*).

The species of the genus seem to fall into two natural groups, the one having the eye largely covered by a transparent adipose eyelid, the other group having the eyelid obsolete. These groups should apparently rank as subgenera. The type of the genus *Mugil*, *M. cephalus*, as now understood, belongs to the first of these groups, which should retain the name *Mugil*. The other group may receive the name of *Liza*, a name almost universal among Spanish-speaking people for the different species of mullet. All the American species belong to the subgenus *Mugil*, the species of *Liza* being confined to the Old World. Of the latter group,

Mugil capito Cuvier (*cæur* Forskål) may be taken as the type. Some of the species of *Liza* approach in dentition to *Chænomugil*, and it is possible that the two groups will be found to intergrade.

Besides the species mentioned below, a species with elongate pectorals, as yet undescribed, has been obtained by Prof. Charles H. Gilbert at Panama. Unfortunately all the known examples of this species have been destroyed by fire.

ANALYSIS OF AMERICAN SPECIES OF MUGIL.*

a. Eye with a well-developed adipose membrane (subgenus MUGIL).

b. Soft dorsal and anal fins almost naked; anal rays, iii, 8; sides with dark longitudinal stripes along the rows of scales; caudal deeply forked; size large.

c. Scales about 33 in a longitudinal series; depth about 4½ in length to base of caudal; teeth very minute; distance from tip of pectoral to front of dorsal about two-sevenths the length of the pectoral; lips rather thin. ..... LIZA, 1.

cc. Scales about 40 in a longitudinal series; depth about 4 in length to base of caudal; teeth close set, rather small; distance of tip of pectoral from front of dorsal about two-ninths length of pectoral. ..... CEPHALUS, 2.

bb. Soft dorsal and anal fins scaly; sides without dark stripes along the rows of scales; caudal less deeply forked; size smaller.

d. Anal rays, iii, 9; scales 35 to 45 in a longitudinal series.

e. Scales 42 to 45 in a longitudinal series; teeth small, hair-like; lips rather thin. ..... INCILIS, 3.

ee. Scales 35 to 38 in a longitudinal series.

f. Pectoral nearly reaching origin of dorsal; the distance from tip of pectoral to front of dorsal about one-sixth the length of the pectoral; teeth rather wide set, very small, scarcely visible without a lens in the adult; larger in the young; scales 35 or 36 in a longitudinal series. ..... GAIMARDIANUS, 4.

ff. Pectoral not nearly reaching origin of dorsal; the distance from tip of pectoral to front of dorsal being in the adult about one-sixth length of pectoral; teeth close set, rather small (but distinctly visible without a lens); scales 38 or 39 in a longitudinal series. ..... CUREMA, 5.

dd. Anal rays, iii, 8; scales very large, about 33 in a longitudinal series; teeth wide set, larger than in any other species, about as long as the nostril; upper lip thick; pectoral not nearly reaching front of dorsal; size small. ..... BRASILIENSIS, 6.

1. Mugil liza. *Lebrancho. Liza. Queriman.*

Mugil liza CUVIER & VALENCIENNES, xi, 83, 1836 (Brazil, Porto Rico, Maracaibo, Surinam, Martinique); JENYNS, Zoöl. Beagle, Fishes, 1842, 80; Günther, iii, 423, 1861 (West Indies, British Guiana); GOODE, Bull. U. S. Nat. Mus., 5, 1876, 63 (Bermudas); STEINDACHNER, Fisch-Fauna Magdalenen-Stromes, 1878, 10 (Carthagena, Cannavierias, Victoria, Rio Janeiro, Rio Grande do sul, Maldonado, Montevideo, Puerto San Antonio, Patagonia).

Mugil lebranchus POEY, Memorias, ii, 1860, 260, tab. 18, fig. 3 (Cuba); POEY, Synopsis, 1868, 388; POEY, Enumeratio, 1875, 98.

* *Mugil platanus* Günther, a species which we have not seen, is omitted in this analysis.

Habitat. Cuba to Patagonia.

Head, 4 in length ($5\frac{1}{4}$ including caudal); depth, $4\frac{4}{7}$ ($5\frac{6}{7}$); D. IV–I, 8; A. III, 8. Scales, 12–35. Length, 18 inches.

Body elongate, its depth less than in any other American *Mugil*. Snout broad and bluntish, the upper profile almost straight and horizontal (in young examples the anterior profile is about equally oblique above and below). Interorbital space gently convex, its width 2 in head. Upper lip rather thin. Space at the chin between the mandibulary bones oblanceolate, acutish posteriorly. Preorbital large, almost covering maxillary. Eyes hidden anteriorly and posteriorly by a broad adipose membrane. Teeth very minute.

Scales large, those on top of head larger; about 21 large scales between origin of dorsal and tip of snout; soft dorsal and anal almost naked. Margin of soft dorsal very concave; the sixth ray shortest, 3 times in second and longest ray. Anal similar to soft dorsal, but slightly less concave. Caudal deeply forked.

Color dusky above, silvery below. A dusky streak along each row of scales, this streak not so wide as in *M. cephalus*. Scales on side and opercle with dark punctulations. Ventrals pale yellowish, the fins otherwise dusky.

This species is abundant in the markets of Havana, where it is usually known as *Lebrancho*. It has not yet been noticed in the waters of Florida, although probably occurring there.

It is readily distinguished from *Mugil cephalus* and other species with naked dorsal and anal by its large scales.

Its synonymy presents little difficulty. The Cuban form was separated by Poey under the name of *Mugil lebranchus* on account of slight discrepancies or errors in the description of Valenciennes. The species *lebranchus* has been regarded as doubtful by Poey. There seems, in fact, no reason of importance for thinking *liza* and *lebranchus* different.

2. **Mugil cephalus.** *Striped Mullet. Common Mullet. Céfalo. Cephalus.* Antiquarum.

MUGIL, Artedi, Genera, xxvi, 32, 1738. (Synonymy includes several species; description not diagnostic.)

Mugil cephalus, LINNÆUS, Syst. Nat., x, 1758, 316 (based on ARTEDI): CUV. & VAL., xi, 1836, 19 (Mediterranean); GÜNTHER, iii, 1861, 417 (River Niger); (and of European authors generally).

Mugil albula, LINNÆUS, Syst. Nat. xii, 520, 1766 (Charleston); GMELIN, Syst. Nat., 1788, 1398 (copied); CUV. & VAL., xi, 1836, 96 (New York; DE KAY, New York Fauna, Fishes, 1842, 146 (New York); GOODE, Proc. U. S. Nat. Mus., 1879, 116 (Saint John's River); GOODE & BEAN, *op. cit.*, 1879, 148 (West Florida); BEAN, *op. cit.*, 1880, 102 (Wood's Holl, Newport, Washington Market, North Carolina, Charleston); JORDAN & JOUY, *op. cit.*, 1881, 13 (San Diego, Santa Barbara, San Francisco); JORDAN & GILBERT, *op. cit.*, 1881, 143 (Monterey, southward); GOODE & BEAN, *op. cit.*, 1882, 239 (Gulf of Mexico); JORDAN & GILBERT, *op. cit.*, 1882, pp. 266, 379, 588 (Charleston, Galveston, Cape San Lucas, Panama); JORDAN & GILBERT, Bull. U. S. Nat. Mus., 1882, 106 (Mazatlan); JORDAN & GILBERT, Synopsis Fishes North America, 1883, 403 (Atlantic coast U. S.), (and of recent American writers generally).

Mugil tang, BLOCH, "Ichthyologia, taf. 395," about 1795 (Africa); BLOCH & SCHNEIDER, Systema Ichthyologia, 1801, 115 (copied).

Mugil plumieri, BLOCH "Ichthyologia, taf. 396" (St. Vincent; on a drawing by Plumier); CUV. & VAL., 1836, xi, 90 (Martinique, Brazil, New York); DE KAY, New York Fauna, 1842, 147 (New York); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1878, 381–382 (Beaufort Harbor).

Sphyræna plumieri, BLOCH & SCHNEIDER, Ichthyologia, 1801, 110, (copied).

Mugil lineatus, (MITCHILL), CUV. & VAL., xi, 96, 1836 (New York); DE KAY, New York Fauna, Fishes, 1842, 144 (New York); GÜNTHER, iii, 420, 1861; AYRES, Boston, Jour. Nat. Hist., v, 265, pl. 12 (Brookhaven).

Mugil rammelsbergii, TSCHUDI, Faun., Peruan., Ichthy., 1845, 20 (Peru); GÜNTHER, iii, 1861, 420 (Chili).

Mugil liza, GAY, "Hist. Chili, ii, 256, 1847, lam. 4b, fig. 2" (*not of Cuvier*).

Mugil berlandieri, GIRARD, U. S. Mexican Boundary Survey, 1859, 20, pl. 10, fig. 1 (St. Joseph's Island, Indianola, Brazos Santiago, Brazos and Galveston, Tex.).

Mugil güntheri, GILL, Proc. Acad. Nat. Sc. Phila., 1863, 169 (Western coast Central America; *not of Steindachner*).

Mugil mexicanus, STEINDACHNER, Ichthy. Beiträge, iii, 59, 1878 (Acapulco); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1881, 274 (Punta San Ygnacio, Mexico); JORDAN & GILBERT, Synopsis Fishes North America, 1883, 403 (Pacific coast of U. S., south of Point Concepcion).

Mugil cephalotus, LOCKINGTON, Amer. Nat., 1879, 305 (California); STEINDACHNER, Ichth. Beitr., x, 39, 1881; (identification of *Mugil mexicanus;* probably not *Mugil cephalotus* C. & V., which is a species of Southern Asia).

Habitat.—Coasts of Southern Europe and Northern Africa; Atlantic coast of America, from Cape Cod to Brazil; Pacific coast, from Monterey to Chili (not yet known from Cuba).

Head, $4\frac{1}{6}$ ($5\frac{1}{3}$); depth, $3\frac{5}{6}$ (5); D. IV–I, 8; A. III, 8 (very rarely III, 7). Scales, 13–41. Length, $10\frac{1}{2}$ inches.

Body rather robust, somewhat compressed; its depth moderate. Snout rather narrow and acutish, its upper profile little less oblique than lower. Interorbital space slightly convex, $2\frac{2}{5}$ in head. Upper lip rather thin. Space at the chin between the mandibulary bones oblanceolate, acutish posteriorly. Preorbital narrow, not nearly covering the maxillary. Eyes hidden anteriorly and posteriorly by a broad adipose membrane. Teeth close-set, rather small, but evident. Scales rather small; about 23 large scales between origin of dorsal and tip of snout; scales on top of head slightly enlarged; soft dorsal and anal, with very few scales. Margin of soft dorsal concave, the seventh ray shortest, $2\frac{1}{2}$ times in length of second or longest ray; anal similar to soft dorsal, but less concave. Pectoral reaching nearly to front of spinous dorsal. Caudal deeply forked.

Color dark bluish above; sides silvery, with conspicuous dark stripes along each row of scales; pale yellowish below. Ventrals yellowish, the other fins dusky.

This is the common mullet of our South Atlantic and Gulf coast, in which region it is one of the most abundant and important food-fishes. It is equally abundant along the coast of Southern California and

southward. In tropical America it seems to be less abundant, and in Cuba it has not yet been found. In the Mediterranean it is also an abundant food-fish, although probably less common than *Mugil œur* (*capito*).

We have carefully compared specimens of this type from Venice (*Mugil cephalus*), from various points on the east coast of the United States (*Mugil albula=lineatus*), from California and Mexico (*Mugil mexicanus*), and from Chili (*Mugil rammelsbergi*). They agree fully in form, color, fin-rays, squamation, dentition, and we find ourselves entirely unable to point out any distinctive characters among them at all likely to be permanent. We therefore regard them as a single species. Varietal names could be given to specimens from these different localities by any one so disposed, but at present we know of no characters to mark such varieties.

As to the synonymy a few words may be necessary.

The name *cephalus* was based on a long description by Artedi of some mullet, the habitat not stated. This description contains nothing distinctive; but, on the whole, it seems to point to the present species, which was the *cephalus* of the Romans, and is still the *Céfalo* of the Italians. Valenciennes, however, thinks that Artedi's fish was probably the *Mugil œur* (*capito*), because of this expression: "*oculi nulla cute communi tecti*," "an expression which he would certainly not have employed if he had examined the eyes of a true *cephalus*."

But this seems to me not so sure. Even in the species with the adipose eyelid, the eye is not covered by the common skin of the head, the pupil being naked.

The *Mugil cephalus* of Cuv. & Val., and of all later writers is the present species.

The *Mugil albula*, which first appears in the twelfth edition of the Systema Naturæ, is based on a fish sent from Charleston, by Dr. Garden. This specimen has been examined by Messrs. Goode and Bean, and identified with the present species.

The names *plumieri* and *lineatus* undoubtedly belong to this species, as also that of *berlandieri*.

Mugil rammelsbergi is the representative of this form on the Pacific coast of South America. It is regarded as different by Günther and Steindachner, but our specimens show no tangible distinctive characters.

The description of *Mugil güntheri* does not fully agree with *M. cephalus*. The discrepancies are probably due to the small size or poor condition of the original type, which is now lost.

Mugil mexicanus does not appear to differ at all from the Atlantic form. The original type had seven soft rays in the anal, but the normal number in the California mullet is right. Lockington and Steindachner have since identified this species with *Mugil cephalotus*, C. & V., from Southern Asia. There is nothing in the descriptions of the latter spe-

cies to forbid this identification, but we prefer not to unite *cephalotus* with *cephalus* until Asiatic specimens are compared. If they are really the same, *Mugil cephalus* is a cosmopolitan species, like *Elops saurus*, *Albula vulpes*, and other similar forms.

If the identification of *Mugil cephalus*, L. with this species be regarded as uncertain, the name *Mugil albula*, concerning which no doubt exists, should be used.

3. Mugil platanus.

Mugil platanus, GÜNTHER, Ann. Mag. Nat. Hist., July, 1880, 9. (Buenos Ayres.)

Habitat.—Coast of Buenos Ayres. This species, briefly described by Dr. Günther, is closely related to *Mugil cephalus*. The scales appear to be larger (lat. l. 38), the head broader, the interorbital width being half the length of the head. The coloration is not described, so that we cannot say whether this is striped like *M. cephalus* and *M. liza* or not.

4. Mugil incilis. *Trench Mullet.*

Mugil incilis, HANCOCK, Lond. Quart. Journ. Sc., 1830, 127 (Guiana); GÜNTHER, Fishes Central America 1869, 443, (Dutch and British Guiana; Chagres River); STEINDACHNER, Fisch Fauna Magdalenen-Stromes, 1878, 10 (Rio Magdalena, San Domingo, Demerara, Maranhaõ, Pará, Cameta Porto de Moz, Bahia, San Matheos, Chiapam); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 624 (Panama); JORDAN & GILBERT, Bull. U. S. Fish Comm. 1882, 109 (Panama).

Mugil güntheri, STEINDACHNER, Notizen, i, 12, 1864 (British Guiana).

Habitat.—Antilles, northern coasts of South America, both coasts of Central America, ascending the streams.

This species appears to be abundant on both coasts of tropical America. We have, however, seen but a single specimen. This is in the museum of Yale College, having been obtained at Panama. It is very well distinguished from *Mugil curema* by the small size of the scales.

As already remarked by Steindachner, the long description by Hancock of his "Trench Mullet" (*Mugil incilis*)* contains nothing distinc-

* The following is Dr. Hancock's original description: "In the Trench Mullet (*Mugil incilis*), as we may designate this species (being chiefly found in the trenches or ditches dug for draining the flat lands of the coast of Guiana), the scales are small; the anal fin has 12 rays; grows to 8 or 10 inches in length; is of a lighter color than the queriman, but otherwise differs very little from a young queriman of the same size; the structure of the stomach is also the same, being a sort of gizzard. Like the latter fish, it lives entirely by suction. It delights in water that is slightly brackish; and although it is often found on the coast, yet a sudden immersion in sea-water soon kills it. I once observed at Cape Batave (the property of Mr. Gilgens), on the west coast of Essequibo, great numbers of mullets swimming with their heads or snouts out of the water. On inquiry I found that the front dam had given way in the night from a high spring tide, and nearly filled the trenches with salt water. It appears extraordinary that this fish, although it constantly inhabits fresh-water trenches, is never found (not to my knowledge at least) in the natural pools or rivulets of fresh water; and I am not certain whether it is ever found in the proper salt water of the ocean, for the water of the coast is seldom very salt, &c. The only obvious

tive except that the anal rays are III, 9, and the scales are much smaller than in the "Queriman" (*Mugil liza*). These statements are equally true of *M. curema* and *M. gaimardianus*. As, however, Dr. Günther has received numerous specimens from British Guiana, he may have some good reason for retaining Hancock's name for this species, rather than to regard it as a synonym of *curema*.

The name of *güntheri*, given to this species by Steindachner, is preoccupied in this genus.

5. Mugil gaimardianus. *Red-eye Mullet; Liza Ojo de Perdriz.*

Mugil gaimardianus, DESMAREST, Dict. Class, 1831, tab. 109, (no description); POEY, Ann. Lyc. Nat. Hist., N. Y., 1875, 64, tab. 7., fig. 1–3 (Cuba); POEY, Enumeratio, 1875, 99.

Habitat.—Cuba, Florida Keys.

Head, 4 ($5\frac{1}{4}$); depth, $3\frac{3}{5}$ ($4\frac{3}{4}$). D. IV, I, 8; A. III, 9. Scales 11–35 or 36. Length, 11 inches.

Body rather robust, moderately compressed. Snout rather narrow and pointed, upper profile almost as oblique as lower. Interorbital space convex, $2\frac{1}{4}$ in head. Upper lip rather thick, about as in *M. curema*. Space at the chin between the mandibulary bones, elliptical, acutish in front and behind, scarcely longer than snout. Preorbital rather narrow, covering about half of the maxillary. Eyes hidden anteriorly and posteriorly by a broad adipose membrane. Teeth rather wide-set, very small, not visible without the aid of a lens. Scales in the adult rather large, evident in the young, about 20 in a line from origin of spinous dorsal to tip of snout; soft dorsal and anal, densely scaly. Soft dorsal concave on its margin; the seventh ray shortest, $2\frac{1}{2}$ in second or longest ray. Anal similar to soft dorsal but more concave. Pectoral reaching very nearly to front of spinous dorsal. Caudal forked.

Color dusky above, with bluish reflections, silvery below, no dusky streaks along sides. Spinous and soft dorsal dusky, the latter finely

distinction between the queriman and trench mullet appears to be in the anal fin and the scales on the back of the head, the anal fin in the queriman having only 11, while the trench mullet has constantly 12 rays. The scales on the back of the head of the former are marked with concentric circles, but the trench mullet shows no trace of this character; its scales are smaller and quite smooth; the head is not so angular, is less flattened, of a light color, and is more delicate in appearance, *i. e.*, taking a full-grown trench mullet and a queriman of the same size for comparison, the scales in the latter are stouter and much more developed. But in these respects you require to compare them together to observe the difference, and that with somewhat careful attention, being so near alike that many think them the same species, that the mullet is the young of the queriman. The lips are protractile in both. I observe very fine setæ in the lips in both species, but less crowded in the mullet than in the queriman. The body of the mullet is more soft and flexible than in the queriman, and its taste is also different, having a peculiar, delicate flavor, different from that of other fishes. It has a gall-bladder very small and oval; the queriman has a large, oblong, pointed gall-bladder. In both the liver is situated close to the anterior part of the stomach. The Guiana mullets have 24 dorsal vertebræ; that is, if we include the fan-shaped bone of the tail."

punctulate with brown, its anterior rays tipped with black. Caudal pale, broadly margined with black. Anal pale, its basal half appearing dusky from dark punctulations. Pectoral pale in front, rather dusky behind, where there is a dusky blotch at base.

The above description is taken from a specimen from Cuba. Numerous small specimens from Key West entirely agree with it, except that the teeth are larger, being distinctly visible in both jaws. The body is less compressed and the color lighter.

Little is known of the distribution of this species. It is recorded by Poey as rather rare at Havana. Several specimens were obtained there by Professor Jordan. The young are also common at Key West, where the species is known as Red-eye Mullet.

In Jordan's list of the fishes of Key West in the current volume of the Proceedings, U. S. Nat. Mus. this species was improperly omitted, the young specimens above referred to having been overlooked.

This species is not described by Desmarest and the name *gaimardianus* should date from its use by Poey.

6. Mugil curema. *White mullet; Blue-back mullet; Liza.*

Albula bahamensis (the Mullet), CATESBY, Nat. Hist. Carolina, 1738, taf. 6 (Bahamas).

Mugil curema, CUV. & VAL., xi, 1836, 87 (Brazil, Martinique, Cuba); ?GAY, "Hist. Chil., Zoöl., ii, 1847, 250."

Mugil petrosus, CUV. & VAL., vi, 1836, 89 (Brazil, Surinam, Gulf of Mexico, Cuba); DE KAY, New York Fauna, 1842, 146 (copied).

Mugil braziliensis, GÜNTHER, iii, 431, 1861 (Vera Cruz, San Domingo, Jamaica, St. Vincent, British Guiana, Surinam, Para); GÜNTHER, Fishes Central America, 1869, 443 (Belize, Chiapam, Panama); COPE, Trans. Amer. Philos. Soc., 1870, 481 (St. Croix, New Providence); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1878, 381 and 382 (Beaufort Harbor); STEINDACHNER, Fisch-Fauna Magdalenen-Stromes, 1878, 10; STEINDACHNER, Beiträge III, 1878, 60 (Rio Janeiro, Cannavierias, Campos, Mendez, Santa Cruz, Porto Alegre, Porto Seguro, Muriahe, Pernambuco, Ceará, Bahia, Rio Pará, Carthagena, St. Thomas, Panama, Acapulco, Magdalena Bay); GOODE, Proc. U. S. Nat. Mus., 1879, 116 (Saint John's River); GOODE & BEAN, *op. c.*, 1879 (West Florida); JORDAN, *op. c.*, 1880, 20 (East Florida); JORDAN & GILBERT, *op. c.*, 1881, pp. 232, 233, 274, 277 (Porto Escondido, Mex.; La Union, San Salvador; Guaymas; Mulege, Lower Cal.); GOODE & BEAN, *op. c.*, 1882, 239 (Gulf of Mexico); JORDAN & GILBERT, *op. c.*, 1882, pp. 238, 374, 379, 588, 624 (Cape San Lucas, Colima, Panama, Charleston); JORDAN & GILBERT, Bull. U. S. Nat. Mus., 1882, 106, 109, 112 (Mazatlan, Panama, Punta Arenas); JORDAN & GILBERT, Synopsis Fishes North America, 403, 1883 (Cape Cod to South America and Lower California); POEY, Ann. Lyc. Nat. Hist. New York, 1875, xi, 61, tab. 7 (Cuba); POEY, Enumeratio, 1875, 99; JORDAN, Proc. U. S. Nat. Mus., 1884 (Key West). (Not of Agassiz & Spix.)

Mugil lineatus, STORER, Hist. Fishes Mass., 1867, 167, pl. 16, f. 4. (*Not of Mitchill.*)

Habitat.—Atlantic coast of America from Cape Cod to Brazil; Pacific coast of America from Magdalena Bay to Chili.

Head, $4\frac{1}{3}$ ($5\frac{1}{2}$); depth, $3\frac{5}{6}$. D. IV, I, 8; A. III, 9. Scales 12–38. Length, $11\frac{1}{3}$ inches.

Body moderately elongate, its depth about equaling that of *M. cephalus*. Snout rather narrow and pointed, the upper profile not so oblique as lower. Interorbital space slightly convex, $2\frac{4}{9}$ in head. Upper lip rather thick. Space at the chin between the mandibulary bones oblanceolate, acutish posteriorly. Preorbital rather narrow, nearly covering the maxillary posteriorly. Eyes hidden anteriorly and posteriorly by a broad adipose membrane. Teeth thick-set, rather small, but distinctly visible to the naked eye. Scales rather small, about 23 from origin of dorsal to tip of snout; soft dorsal and anal densely scaled. Soft dorsal slightly concave; the seventh and shortest ray $2\frac{1}{3}$ in second or longest ray. Anal similar to soft dorsal. Pectoral falling short of spinous dorsal by a distance equal to one-third its length in adult, sometimes longer in young. Caudal forked. Color dark olive above, with some bluish reflections; silvery below. No dusky streaks along sides. A rather small dark blotch at base of pectoral. Spinous and soft dorsal and pectorals pale, with numerous small dark punctulations. Caudal pale, yellowish at base; margin of fin blackish. Anal and ventrals yellowish.

This species is very widely distributed in tropical America, being very abundant throughout that region, and equally so on both sides of the continent. We find no difference whatever between Atlantic and Pacific specimens.

This is the species called *Mugil brasiliensis* by all recent writers. It is, however, certainly not the original *Mugil brasiliensis* of Agassiz.

Dr. A. Spaugenberg, curator of the museum at Munich, in which institution the types of Agassiz and Spix are preserved, has kindly given us the following information concerning the types of *Mugil brasiliensis*. The following is a translation of a portion of Dr. Spaugenberg's letter:

"The badly preserved dried example (400 millimeters long) seems to me to be certainly the one figured by Spix, but on this one it is entirely impossible to count the number of anal rays, since the fin is dried down. The distance from the end of the pectoral to the beginning of the dorsal, after allowing for the broken tip of the pectoral, is a good third of the length of the pectoral. The number of scales in a longitudinal series is 32. Teeth, so far as visible, of moderate size. This original type thus best fits your species 1. (=*Mugil trichodon* Poey).

"Besides this dried example, which best fits the figure in the above named work (Agassiz and Spix), if it does not wholly agree with it, we have in a bottle of spirits two other specimens labelled *Mugil brasiliensis* Spix, which do not resemble the figure and the dried specimen, and, in fact, each of them is a distinct species, so that, under the same label, we have three distinct species.

"Of these the larger specimen shows the following peculiarities: Anal, III, 9. Scales of the lateral line, 35. Distance of the end of the pectoral

from the beginning of the dorsal, one-third the length of the pectoral (nearly 1.20: 3.70). Small teeth. This form agrees with your species 2 (*Mugil gaimardianus*), except in the distance of the pectoral from the dorsal.

"The small example, in its whole appearance quite unlike the preceding, shows: Anal, III, 9. Scales, 38 or 39. Distance of the end of the pectoral from the dorsal very slight (about one-twelfth of the length of the pectoral, nearly .03 to .34); teeth large, absolutely larger than in the preceding larger fish.

"This animal differs from your species 3 (*Mugil curema=brasiliensis* Auct.) again in the distance of the pectoral from the dorsal. To conclude: Only the dried example agrees exactly with your species 1 (*trichodon*), (except in the number of anal rays, which cannot be counted), and this example is certainly the one originally figured by Spix (I have also asked Professor Zittle to verify this), the discrepancies of the figure being the fault of the artist."

In any case, therefore, whatever the two smaller specimens collected by Spix and referred to *M. brasiliensis* by Agassiz, may prove to be, it is evident that the original type of *Mugil brasiliensis* does not belong to the species called by the latter name by Günther, Steindachner, and other recent writers. There can be little doubt, in fact, of its identity with *Mugil trichodon* Poey, for which reason we here retain for the latter species the name *Mugil brasiliensis*.

Mugil curema is doubtless the present species, as I am informed by Dr. Sauvage that the type preserved in the museum at Paris has 40 scales in a longitudinal series.

Mugil petrosus is to all appearance also the same species, some of the specimens (New York) being certainly the same.

Mugil platanus, Günther is identified by Steindachner with this species, the presence of but 8 soft rays in the anal fin being regarded as accidental. As, however, in *M. platanus*, the dorsal and anal fins are said to be naked, it is probably most nearly related to *M. cephalus*, of which it may be a variety.

7. Mugil brasiliensis. *Fan-tail mullet.*

Mugil brasiliensis, AGASSIZ, SPIX, Pisc. Brasil., 1829, 234, tab. 72 (Brazil) (typical example; not the two smaller ones).

Mugil trichodon, POEY, Ann. Lyc. Nat. Hist. New York, 1875, xi, 66, tab. 8, f. 4–8 (Cuba); POEY, Enumeratio, 1875, 99; JORDAN, Proc. U. S. Nat Mus., 1884 (Key West).

Habitat.—Cuba, Florida Keys, Brazil. Head, $4\frac{1}{5}$ ($5\frac{1}{4}$); depth, $3\frac{2}{3}$ ($4\frac{2}{3}$). D. IV, I, 8. A. III, 8; Scales, 11–33. Length, 11 inches.

Body rather robust, its depth somewhat greater than in *M. curema*. Snout rather narrow and pointed, the upper and lower profile about equally oblique. Interorbital space flattish or slightly convex, $2\frac{1}{2}$ in head. Upper lip thick; thicker than in any other species here described. Space at the chin between the mandibulary bones oblanceo-

late, acutish posteriorly. Preorbital narrow, covering little of maxillary. Eyes hidden anteriorly and posteriorly by a broad adipose membrane. Teeth wide-set; larger than in the other species; plainly visible in both jaws, and about as long as the nostril. Scales large, about 21 from origin of dorsal to tip of snout; soft dorsal and anal densely scaled. Soft dorsal concave; the seventh ray shortest, 2¾ in second or longest ray; anal similar to soft dorsal. Pectoral not reaching nearly to front of spinous dorsal. Caudal broad, forked.

Color dusky olive above, with some bluish reflections; silvery below. No dusky streaks along the rows of scales. A dark blotch at base of pectoral. Dorsals and caudal pale, the former with very small dark punctulations. Caudal margined with blackish. Anal and ventrals yellowish. Pectorals pale, finely punctulate with brown.

This little mullet is very abundant at Key West, where it is known as fan-tail mullet. At Cuba it is reported as rare by Poey. It has not been noticed elsewhere. Numerous specimens, large and small, are in our collection, none of them quite a foot in length.

The reasons for adopting for this species the name of *brasiliensis* instead of that of *trichodon* are stated under *Mugil curema*.

Measurements.

Name of species / Locality	*Liza.* Havana.		*Cephalus.* Cedar Key.		*Incilis.* Copied.	
	Inches and 100ths.	100ths of length to base of caudal.	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.
Extreme length	18.00	.....	10.55	.....	7.00	.....
Length to base of caudal	14.10	.....	8.60	.....	5.6	.....
Body:						
Greatest height	.....	22	.....	26	.....	22
Greatest width	.....	19	.....	17	.....	.....
Head:						
Greatest length	.....	26	.....	24	.....	22
Greatest width	.....	18	.....	18	.....	14
Width of interorbital area	.....	13	.....	10	.....	9
Length of snout	.....	5½	.....	6	.....	.....
Dorsal (spinous):						
Distance from snout	.....	48	.....	50	.....	.....
From tip of pectoral to origin of dorsal	.....	5	.....	4	.....	.....
Height at first spine	.....	12	.....	14	.....	13
Height at first and longest ray of soft dorsal	.....	12½	.....	13	.....	.....
Height at last ray	.....	7	.....	7	.....	.....
Anal:						
Length of base	.....	12	.....	12	.....	10
Height at first and longest ray	.....	12½	.....	15	.....	.....
Height at last ray	.....	7	.....	7	.....	.....
Caudal:						
Length of middle rays	.....	14	.....	14	.....	.....
Length of upper lobe	.....	30	.....	25	.....	25
Pectoral:						
Length	.....	18	.....	19	.....	.....
Ventral:						
Length	.....	15	.....	15	.....	16
Dorsal	IV, I, 8	.....	IV, I, 8	.....	IV, I, 8	.....
Anal	III, 8	.....	III, 8	.....	III, 9	.....
Number of scales in lateral line	35	.....	41	.....	43	.....
Number of scales in transverse row from spinous dorsal to ventrals	12	.....	13	.....	14	.....

Measurements—Continued.

Name of species Locality	*Gaimardianus.* Havana.		*Curema.* Key West.		*Brasiliensis.* Key West.	
	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.	Inches and 100ths.	100ths of length.
Extreme length	11.00		11.30		11.00	
Length to base of caudal	8.50		9.10		8.60	
Body:						
Greatest height		28		26		28
Greatest width		15		16		16
Head:						
Greatest length		26		23		24
Greatest width		17		15⅔		16½
Width of interorbital area		11⅓		9⅔		10
Length of snout		5		4		4½
Dorsal (spinous):						
Distance from snout		50		50		51
From tip of pectoral to origin of dorsal		3		6½		7
Height at first spine		14		13		15
Height at first and longest ray of soft dorsal		14		12		13
Height at last ray		7		6½		6½
Anal:						
Length of base		15		13½		12
Height at first and longest ray		15		12		13
Height at last ray		7		6		6½
Caudal:						
Length of middle rays		18		16		16
Length of upper lobe		31		29		29
Pectoral:						
Length		19		18		17
Ventral:						
Length		16		14		15
Dorsal	IV, I, 8		IV, I, 8		IV, I, 8	
Anal	III, 9		III, 9		III, 8	
Number of scales in lateral line	36		38		33	
Number of scales in transverse row from spinous dorsal to ventrals	11		12		11	

Genus 2.—CHÆNOMUGIL.

Chænomugil, GILL, Proc. Ac. Nat. Sci., Phila., 1863, 169 (*proboscideus*).

But one species of this genus is known. This is allied to some species of the subgenus *Liza*, such as the European *Mugil chelo* and others with thickened lips and enlarged papillæ in more than one series. Unless, however, a more perfect gradation exists than is now known, it should be regarded as constituting a distinct genus, for which the hybrid name *Chænomugil* must be used.

8. Chænomugil proboscideus.

Mugil proboscideus, GÜNTHER, Cat. Fishes, iii, 459, 1861 (Island of "Cordova" [Cardon], West Coast Central America).

Chænomugil (*proboscideus*), GILL, Proc. Ac. Nat. Sci., Phila., 1863, 169 (Generic diagnosis); JORDAN & GILBERT, Bull. U. S. Fish Comm., 1882, 106, 109 (Mazatlan, Panama).

Habitat.—Pacific coast of tropical America, Mazatlan, Cardon, Panama.

This small mullet reaches a length of four or five inches, and is not uncommon on the Pacific Coast of Mexico and Central America. I suppose the island of "Cordova," whence Dr. Günther obtained his typical

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specimens, to be a slip of the pen for Cardon. If this is true, the species is not known from the Atlantic.

The numerous specimens collected by Professor Gilbert having been destroyed by fire, we are unable to add anything to Dr. Günther's account, which is sufficiently full and accurate.

Genus 3.—QUERIMANA.

Querimana, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 588 (*harengus*).

This genus includes little mullets, some of them of very small size, with distinct teeth in the jaws rather than cilia, and with but two spines in the anal fin. In this last regard they differ from the genus *Myxus*, Günther, which has three anal spines. The species, so far as known, are all American, and are very closely related. We refer *Mugil curvidens* provisionally to this genus, not having seen its type. It may, however, prove to belong to *Myxus*.

ANALYSIS OF SPECIES OF QUERIMANA.

a. Teeth in lower jaw distinct; anal rays II, 9 or II, 10.
b. Teeth unusually strong, those in the lower jaw directed downwards and forwards, like those in the upper ..... CURVIDENS, 9.
bb. Teeth feebler, rather ciliiform, the lower not curved downwards. CILIILABIS, 10.
aa. Teeth in lower jaw obsolete; species of very small size.
c. Anal rays II, 9 or II, 10; lat. l. ,38 ..... HARENGUS, 11.
cc. Anal rays II, 7; lat. l., 29 or 30 ..... GYRANS, 12.

9. Querimana curvidens.

Mugil curvidens, CUV. & VAL., xi, 1836, 149, pl. 313 (Ascension, Bahia).
Myxus curvidens, GÜNTHER, iii, 1861, 467 (copied).

Habitat.—Island of Ascension, Bahia.

Nothing is known of this species except what is contained in the original description.

10. Querimana ciliilabis.

Mugil ciliilabis, CUV. & VAL., xi, 1836, 151 (Callao).
Myxus ciliilabis, GÜNTHER, iii, 1861, 467 (copied) Steindachner.
Querimana ciliilabis, JORDAN, Proc. Ac. Nat. Sci. Phila., 1883, 283 (Callao).

Habitat.—Coast of Peru.

The original types of this species in the museum at Paris have been examined by Professor Jordan. The species is very close to *Q. harengus*, differing in the rather stronger dentition, stiffened cilia or teeth being present in both jaws, rather strongest in the upper. Head, $3\frac{2}{5}$ in length; depth, $4\frac{1}{4}$; no adipose eyelid; preorbital serrate; anal spines, 2; first soft ray of anal simple, but evidently articulate.

11. Querimana harengus. *El Verde.*

Myxus harengus, GÜNTHER, iii, 467, 1861 (Pacific coast of Central America); JORDAN & GILBERT, Bull. U. S. Fish Comm., 1882, 106, 109 (Mazatlan, Panama); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 624. (Panama).

Querimana harengus, JORDAN, Proc. Ac. Nat. Sci. Phila., 1883, 283. (Panama, Mazatlan; Zorritas, Peru).

Habitat.—Mazatlan, Panama, Peru.

This little fish is abundant both at Mazatlan and Panama. It is recognized by the fishermen as a distinct species, and at Mazatlan, from its clear green color. It is known as *El Verde.*

Dr. Günther's original types, like all the other specimens examined by us, have but two spines in the anal fin.

12. Querimana gyrans.

Querimana harengus, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 588, 618 (Charleston); (not *Myxus harengus*, GTHR.).

Querimana gyrans, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1884 (Key West).

Habitat.—Charleston, Key West.

This curious little fish, the smallest of known mullets, is abundant about Key West, and a few specimens have been taken at Charleston. We venture the prediction that, in time, it will be found to be abundant throughout the West Indies. It may, however, be easily confounded with the young mullets, although its habits are altogether different from those of the latter.

Nominal species arranged in chronological order with identifications.

Nominal species.	Year.	Identification.
Mugil *cephalus*, Linnæus	1758	Mugil cephalus.
Mugil albula, Linnæus	1766	Do.
Mugil tang, Bloch	1795	Do.
Mugil plumieri, Bloch	1795	Do.
Mugil *brasiliensis*, Agassiz	1829	Mugil brasiliensis.
Mugil *incilis*, Hancock	1830	(?) Mugil incilis.
Mugil *liza*, Cuv. & Val	1836	Mugil liza.
Mugil lineatus, Mitchill	1836	Mugil cephalus.
Mugil curema, Cuv. & Val	1836	Mugil curema.
Mugil petrosus, Cuv. & Val	1836	Do.
Mugil *curvidens*, Cuv. & Val	1836	Querimana (?) curvidens.
Mugil *cililabis*, Cuv. & Val	1836	Querimana cililabis.
Mugil rammelsbergi, Tschudi	1845	Mugil cephalus.
Mugil berlandieri, Girard	1859	Do.
Mugil lebranchus, Poey	1860	Mugil liza.
Myxus harengus, Günther	1861	Querimana harengus.
Mugil günther, Gill	1863	Mugil cephalus.
Chænomugil *proboscideus*, Gill	1863	Chænomugil proboscideus.
Mugil *trichodon*, Poey	1875	Mugil brasiliensis.
Mugil *gaimardianus*, Desmarest	1875	Mugil gaimardianus.
Mugil *mexicanus* Steindachner	1875	Mugil cephalus.
Mugil cephalotus, Lockington	1878	Do.
Mugil *platanus*, Günther	1880	Mugil platanus.
Querimana *gyrans*, Jordan & Gilbert	1882	Querimana gyrans.

RECAPITULATION.

We here repeat the list of species recognized by us, with a brief statement of such doubts as may exist in regard to them. The distribution of each species is indicated by the letters U (south Atlantic coast of

United States), C (California), W (western Atlantic, West Indies, Brazil), E (Europe), A (Western Africa), B (southern coast of Brazil and southward), P (Pacific coast of Mexico and Central America), G (western coast of South America).

Genus 1.—MUGIL, (Artedi) Linnæus.

1. *Mugil liza*, Cuv. & Val. (W.).
2. *Mugil cephalus*, L. (E.) (*cephalus*), (A.) (*cephalus*), (U. W.) (*albula*), (C. P.) (*güntheri*= *mexicanus*), (G.) (*rammelsbergi*), (Asia?) (*cephalotus*). (Possibly divisible into geographical subspecies.)
3. *Mugil platanus*, Günther. (B.) (Species not sufficiently known.)
4. *Mugil incilis*, Hancock. (W. P.) (Identification of name *incilis* somewhat doubtful.)
5. *Mugil curema*, Cuv. & Val. (U. W. B. P. G.).
6. *Mugil gaimardianus*, (Desmarest) Poey (W. U).
7. *Mugil brasiliensis*, Agassiz (W. U.).

Genus 2.—CHÆNOMUGIL, Gill.

8. *Chænomugil proboscideus*, Günther (P.).

Genus 3.—QUERIMANA, Jordan & Gilbert.

9. *Querimana? curvidens*, C. & V. (A. W.). (Species unknown to us; of uncertain genus.)
10. *Querimana ciliilabis*, C. & V. (G.).
11. *Querimana harengus*, Günther (P. G.). (Possibly young of *Q. ciliilabis*?).
12. *Querimana gyrans*, Jordan & Gilbert (U.).

SYNOPSIS OF THE GENERA OF THE SUPERFAMILY TEUTHIDOIDEA (FAMILIES TEUTHIDIDÆ AND SIGANIDÆ).

By THEODORE GILL.

Having recently had occasion to inquire into the relations and characteristics of the constituents, and into the applicability of the names employed for the genera of the family "Teuthyes" of Cuvier, I was obliged to dissent from the taxonomic views as well as nomenclature most in vogue, and have reached the conclusions embodied in the following synopsis. The changes of nomenclature have invariably been made in obedience to the rules of the British and American associations for the advancement of science. Those who are lawless, or follow rules only when they suit their purpose or convenience, will doubtless disapprove of the changes. The necessity for the changes has been appreciated by Messrs. Jordan, Meek, and Bean, and the first two had independently reached the same conclusion with reference to the *Teuthis hepatus*.

SUPERFAMILY TEUTHIDOIDEA.

Synonym.

Teuthidoidea *Gill*, Cat. Fishes E. Coast N. Am., p. 8, 1873. (Not defined.)

Acanthopterygian teleocephals with thoracic ventrals; elongated, narrow, and closely connected pelvic bones; cranium with double floor and muscular tube; maxillary (intermaxillary and supramaxillary) bones closely united; undivided posttemporals co-ossified with the cranium; interneurals with transversely expanded buckler-like subcutaneous plates, which intervene between the spines and limit their erection forwards.

I.—TEUTHIDIDÆ.

Synonyms as families.

<Leptosomes, *Duméril*, Zoöl. Anal., p. 134, 1806.
<Acanturini, *Raf.*, Indice d'Ittiol. Sic., p. 16, 1810.
<Zedia, *Raf.*, Analyse de la Nature, 6. fam., 1815.
<Teuthides, *Latreille*, Fam. Nat. du Règne Animal, p. 130, 1825.
<Teuthyes, *Cuvier*, Règne Animal, 2 ed. t. 2, p. 222, 1829.
<Teuthyes, *Cuv. & Val.*, Hist. Nat. des Poissons, t. 10, p. 111, 1835.
<Teuthididæ, *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 34), 1833.
<Teuthyidæ, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 130?, 1838; t. 4, p. 190, 1840.
<Teuthyes, *Agassiz*, Recherches sur les Poissons Fossiles, v. 4, p. [xiii, 2, 12,] 41* 206, 1843.
<Teuthies, *Agassiz*, Rep. Brit. Ass. Adv. Science, 1844, p. 288, 1845.
<Teuthididæ, *Richardson*, Encycl. Brit., v. 12, p. 304, 1856.
=Acanthuroidei, *Bleeker*, Enum. sp. Piscium Arch. Ind., p. xxii, 1859.
<Teuthidoidæ, *Gill*, Cat. Fishes E. Coast N. A., p. 34, 1861.
=Acronuridae, *Günther*, Cat. Fishes in Brit. Mus., v. 3, p. 325, 1861.
<Acronuridæ, *Cope*, Trans. Am. Phil. Soc., n. s., v. 14, p. 459 (Oct. 7, 1870), 1871.
=Acanthuridæ, *Gill*, Arrangement Fam. Fishes, p. 7, 1872.
=Acanthuri, *Fitzinger*, Sitzungsber. k. Akad. der Wissensch. (Wien), b. 67, 1. Abth., p. 31, 1873.
=Acanthuridi, *Poey*, Anal. Soc. Esp. Hist. Nat., t. 4 (Enum Pisc. Cub., pp. 7, 65), 1875.
=Teuthididæ, *Gill*, Cat. Fishes E. Coast N. Am., pp. 8, 23, 1873.
=Acronuridæ, *Günther*, Int. to Study of Fishes, p. 438, 1880.
=Teuthididæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 78, 1882.
=Acanthuridæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 616, 1882.

Synonyms as subfamilies.

=Teuthydini, *Bonaparte*, Trans. Linn Soc. London, v. 18, p. 302, 1840.
=Acanthurinæ, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 177, 255, 1839. (S. F. of Coryphænidæ.)

* Theuties, pp. xiii, 2, 12; Teuthyci, p. 41; Teuthyes, p. 206.

=Teuthyini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 130, 1838; t. 4, p. 190, 1840.
=Teuthyini, *Bonaparte*, Cat. Metod. dei Pesci Europei, p. 7, 1846. (2. S. F. of Teuthyidæ.)
=Teuthiinæ, *Gill*, Cat. Fishes E. Coast N. A., p. 34, 1861.

Teuthidoidea with the abdominal (vertebral) portion much shorter than the caudal; the rayed portions of the dorsal and anal equal and much exceeding the spinous; the ventrals with an external spine and with three to five rays; the head with its rostral portion produced and long, and with epipleurals developed from the ribs.

The neural spine of the last abdominal vertebra (in the nine-spined species) is in advance of the interneural spine, whose head is behind and embraces the base of the recumbent last dorsal spine.

SYNOPSIS OF GENERA.

I. Caudal armature developed as immovable laminæ.
  1. Ventrals with 5 rays each; anal with 3 spines; caudal plates, typically, 4 to 6.....PRIONURUS (1).
  2. Ventrals with 3 rays each; anal with 2 spines; caudal plates typically 2 (rarely 1 or 3).....MONOCEROS (2).

II. Caudal armature developed as movable antrorse spines, erectile from and depressible in grooves.
  1. Ventrals with 5 rays.
    a^1. Teeth fixed and strong.
      b^1. Dorsal spines 9 (rarely 7 or 8).....TEUTHIS (3).
      b^2. Dorsal spines 3 to 5.....ZEBRASOMA (4).
    a^2. Teeth movable and setiform, but with dilated apices; (D. 8).....CTENOCHÆTUS (5).
  2. Ventrals with 3 rays.....COLOCOPUS (6).

DIAGNOSES OF GENERA.

1. PRIONURUS.

Synonymy.

= Prionurus *Lacépède*, Ann. Mus. d'Hist. Nat., t. 4, p. 205.
= Prionurus *Cuvier*, Règne Animal, 2. ed., t. 2, p. 224, 1829.
= Prionurus *Günther*, Cat. Fishes Brit. Mus., v. 3, p. 347, 1861.
Acanthurus sp. *Langdorff.*
Naseus sp. *Bleeker*, olim.

Teuthidids with many (4 to 6) pairs of fixed carinated caudal plates, 5-rayed ventrals, and 3 anal spines.

TYPE.—*P. microlepidotus*, Lac.

2. MONOCEROS.

Synonymy.

> Monoceros, *Bloch*, Syst. Ich., *Schneid.* ed., p. 180, 1801.
> Naso, *Lacépède*, Hist. Nat. des Poissons, t. 3, p. 106, 1802.
> Nasonus, *Rafinesque*, Analyse de la Nature, p. —, 1815.

>Les Nasons (Naseus), *Cuvier*, Règne Animal, ed. 2, t. 2, p. 224, 1829.
>Les Axinures, *Cuvier*, Règne Animal, ed. 2, t. 2, p. 225, 1829.
>Les Priodons, *Cuvier*, Règne Animal, ed. 2, t. 2, p. 225, 1829.
>Priodontichthys, *Bonaparte*, Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 34, 1833.
>Keris, *Cuv. & Val.*, Hist. Nat. des Poissons, t. 10, p. 304, 1835.
>Callicanthus, *Swainson*. Nat. Hist. Fishes, etc., v. 2, pp. 256, (C. elegans), 1839.
=Naseus, *Günther*, Cat. Fishes Brit. Mus., v. 3, p. 347, 1861.
>Keris, *Günther*, Cat. Fishes Brit. Mus., v. 3, p. 355, 1861.
Chætodon sp., *Hasselquist* et al.
Harpurus sp., *Forster*.
Acanthurus sp., *Shaw*.
Aspisurus sp., *Rüppell*.
Acronurus sp., *Gronow*.

Teuthidids with, typically, 2 (rarely 1 or 3) pairs of fixed carinated caudal plates, 3-rayed ventrals, 2 anal spines, and generally with an antrorse horn-like frontal process.

TYPE.—*M. unicornis*, (Forsk.).

This genus appears to be a composite one, but I have not the material to satisfy myself whether such is the case or not.

3. TEUTHIS.

Synonymy.

<Hepatus, *Gronow*, Zoophylacium, p. 113, 1763.
<Teuthis, *Linné*, Systema Naturæ, 12. ed., t. 1, p. 507, 1766.
<Acanthurus, *Forskal*, Descriptiones Animalium, p. 25, 1775 (section of Chætodon Linn.)
<Harpurus, *Forster* in Linnæi Syst. Nat., ed. Gmelin, t. 1, p. 1269? 1788.
<Acanthurus, *Bloch*, Systema Ichthyologiæ, ed. Schneider, p. 211, 1801.
×Aspisurus, *Lacépède*, Hist. Nat. des Poissons, t. 4, p. 556, 1802.
<Les Theuthies (Theuthis), *Cuvier*, Tab. El. Hist. Nat., p. 371, an. 6 (1798.)
<Les Acanthures, Bl. (Theutis, L., Harpurus, Forsk.), *Cuvier*, Règne Animal, t. 2, p. 330, 1817.
<Teuthis, *Bonaparte*, Giorn. Arcad. di Scienze, t. 52 (Saggio Distrib. Metod. Animali Vertebr. a sangue freddo, p. 34), 1833.
??Acanthurus, *Bonaparte*, Giorn. Arcad. di Scienze, t. 52 (Saggio Distrib. Metod. Animali Vertebr. a sangue freddo, p. 34), 1833. (Subgenus of *Teuthis* without diagnosis or type.)
>Acanthurus, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 255, 1839.
>Teuthys, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 255, 1839.
×Ctenodon, *Swainson*, Nat. Hist. and Class. Fishes &c., v. 2, pp. 255, 1839.
=Acronurus, *Gronow*, Cat. of fish collected and described, p. 142, 1854.
=Acanthurus § 1, *Günther*, Cat. Fishes, Brit. Mus., v. 3, pp. 325, 327, 1861.
=Acanthurus A. Rhombotides, *Day*, Fishes of India, v. 1, p. 202, 1876.
<Acanthurus, *Gthr.*, Ann. and Mag. Nat. Hist., v. 8, p. 320, 1871 (Keris young).
<Acanthurus, *Lütken*, 1880.

Teuthidids with a pair of antrorse movable caudal spines, strong fixed teeth, 5-rayed ventrals, and generally 9 (rarely 7 or 8) dorsal spines.

TYPE.—*T. hepatus*, Linn.=*Acanthurus chirurgus*, Bloch, &c.

4. ZEBRASOMA.

Synonymy.

??Scopas, *Bonaparte*, Giorn. Arcad. di Scienze, t. 52 (Saggio Distrib. Metod. Animali Vertebr. a sangue freddo, p. 34)* 1833.
>Harpurus, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 256, 1839 (not Forskäl).
>Zebrasoma, *Swainson*, Nat. Hist. and Class. Fishes, &c. v. 2, pp. 256, 1839.
=Acanthurus (§ 4), *Günther*, Cat. Fishes, Brit. Mus., v. 3, pp. 326, 342, 1861.
=Acanthurus D. Harpurus, *Day*, Fishes of India, v. 1, pp. 202, 207, 1876.

Teuthidids with a pair of movable antrorse spines, movable setiform teeth with dilated apices, 5-rayed ventrals, and 3 to 5 dorsal spines.

TYPE.—*Z. velifer*, (Bloch).

5. CTENOCHÆTUS.

Synonymy.

??Ctenodon, *Bonaparte*, Giorn. Arcad. di Scienze, t. 52 (Saggio Distrib. Metod. Animali, a sangue freddo, p. 34), 1833; not described nor type specified.
<*Ctenodon*, Swainson.
=Acanthurus, § 3, *Günther*, Cat. Fishes Brit. Mus., v. 3, pp. 326, 342, 1861.
=Acanthurus C. Ctenodon, *Day*, Fishes of India, v. 1, pp. 202, 207, 1876.

Teuthidids with a pair of movable antrorse spines, fixed strong teeth, 5-rayed ventrals, and 8 dorsal spines.

TYPE.—C. *strigosus*=*Acanthurus strigosus*, Bennett.

6. COLOCOPUS.

Synonymy.

= Acanthurus § 2, Günther, Cat. Fishes Brit. Mus., v. 3, pp. 325, 341.
= Acanthurus, "B," *Day*, Fishes of India, v. 1, pp. 202, 206, 1876.

Teuthidids with a pair of antrorse movable spines, strongly fixed teeth, 3-rayed ventrals, and 9 dorsal spines.

TYPE.—*C. lambdurus* (new name) = *Acanthurus hepatus* (Bloch, Schneider) Günther Fische Südsee, B, 1, p. 115, pl. 75 (not *Teuthis hepatus*, Linn.).

II.—SIGANIDÆ.

Synonyms as families.

< Chætodonia, *Raf.*, Analyse de la Nature, 5e. fam., 1815.
< Theutyes, *Cuvier*, Règne Animal, 2. ed., t. 2. p. 222, 1829.
< Teuthides, *Latreille*, Fam. Nat. du Règne Animal, p. 130, 1825.
< Teuthyes, *Cuv. & Val.*, Hist. Nat. des Poissons, t. 10, p. 111, 1835.
= Teuthididæ, *Bon.*, Giorn. Arcad. di Scienze, v. 52, p.—, (Saggio Distrib. Metod. Animali Vertebr. a sangue freddo, p. 34), 1832.
< Siganoideæ, *Richardson*, Fauna. Bor.-Am., vol. 3, p. 86, 1836.
= Teuthididæ, *Richardson*, Encycl. Brit., vol. 12, p. 304, 1856.

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*No diagnosis. No type is given.

= Amphacanthoidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xxii, 1859.
= Teuthididæ, *Günther*, Cat. Fishes Brit. Mus., v. 3, p. 313, 1861.
= Teuthididæ, *Günther*, Archiv für Naturg., 28. Jahrg , B. 1, p. 59, 1862.
< Acronuridæ, *Cope*, Proc. Am. Assoc. Adv. Sci., v. 20, p. 342, 1872.
= Amphacanthidæ, *Gill*, Arrangement Families Fishes, p. 7, 1872.
?? Acanthuri, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1 Abth., p. 33, 1873.

Teuthidoidea with the abdominal (vertebral) about as long as the caudal region, the rayed portions of the dorsal and anal fins subequal and shorter than the spinous portions of the dorsal or anal, the ventrals each with two marginal (external and *internal*) spines, between which intervene three rays, the head with its rostral portion moderate, and without epipleurals to ribs.

The type is also characterized by a singular uniformity of the fins, all known species (over 30) having alike 13 spines and 10 rays in the dorsal, and 7 spines and 9 rays in the anal; there are 23 vertebræ—10 abdominal and 13 caudal.

SIGANUS.

Synonymy.

< Hepatus, *Artedi*, Genera Piscium.
< Hepatus, *Gronow*, Zoophylacium, p. 113, 1763.
< Teuthis, *Linné*, Systema Naturæ, 12 ed., t. 1, p. 507. 1766.
= Siganus, *Forskål*, Desc. Animal. quæ observ., pp. x, 26, 1775.*
= Centrogaster, *Houttuyn*, Acta. Soc. Harlem, v. 20, p. 333, 1782.
= Amphacanthus, *Bloch*, Systema Ichthyologiæ, ed. *Schneider*, p. 206, 1801.
= Centrogaster, *Lacépède*, Hist. Nat., des Poissons, t. 3, p. 307, 1802.
= Les Sidjans (Amphacanthus Schn.), *Cuvier*, Règne Animal, t. 2, p. 330, 1817.
= Les Sidjans (Siganus Forsk.), *Cuvier*, Règne Animal, 2 ed., t. 2, p. 223, 1829.
= Teuthis, *Cantor*, Cat. Malayan Fishes, p. 207.
= Teuthis, *Gronow*, Cat. Fish. collected and described, p. 142, 1854.
Scarus, sp., *Forskål.*
Chætodon sp., *Bloch.*

TYPE.—*S. rivulatus*, Forsk.

The names proposed in chronological order for genera of the Teuthidoidæ are as follows:

§ 1. "*Prelinnæan.*"

1738. *Hepatus* Artedi = TEUTHIS.
1744. *Rhombotides* Klein = TEUTHIS.
1763. *Hepatus* Gronow = TEUTHIS.

§ 2. "*Binomial.*"

1766. *Teuthis* Linné = TEUTHIS.
1775. *Siganus* Forskål = SIGANUS.
1775. *Acanthurus* Forskål = *Teuthis.*
1782. *Centrogaster* Houttuyn = Siganus.

* According to Cuvier and Valenciennes (Hist. Nat. des Poissons, v. 10, p. 112—foot note), "Forskal, Faun. arab., dans un feuillet sans pagination à la suite de la préface."

1788. *Harpurus* Forster (MSS ?) = Teuthis.
1788. *Harpurus* vel *Acanthurus* Forster in Gmelin = Teuthis.
1792. *Harpurus* Forster in Walbaum = Teuthis.
1801. *Monoceros* (Bloch) Schneider = MONOCEROS.
1801. *Amphacanthus* (Bloch) Schneider = Siganus.
1801. *Acanthurus* (Bloch) Schneider = Teuthis.
1802. *Naso* Lacépède = Monoceros.
1802. *Aspisurus* Lacépède = Teuthis.
1803. *Buro* Commerson in Lacépède = Siganus.
1803. *Opisotomus* Commerson *fide* Day = Siganus.
1803. *Prionurus* Lacépède = PRIONURUS.
1815. *Nasonus* Rafinesque = Monoceros.
1817. *Siganus* Cuvier = Siganus.
1829. *Naseus* (Commerson) Cuvier = Monoceros.
1829. *Axinurus* Cuvier = Monoceros.
1829. *Priodon* Cuvier = Monoceros.
1832. *Teuthis* Bonaparte (subg. of Teuthis).
1832. *Acanthurus* Bonaparte (subg. of Teuthis).
1832. *Scopas* Bonaparte (subg. of Teuthis)= Zebrasoma ?
1832. *Ctenodon* Bonaparte (subg. of Teuthis)= Ctenochætus?
1832. *Priodontichthys* Bonaparte = Monoceros (= Priodon Cuvier).
1835. *Keris* Cuvier & Valenciennes = Monoceros.
1839. *Acanthurus* Swainson = Teuthis.
1839. *Teuthys* Swainson = Teuthis.
1839. *Ctenodon* = Teuthis.
1839. *Harpurus* = Zebrasoma.
1839. *Zebrasoma* = ZEBRASOMA.
1839. *Callicanthus* = Monoceros.
1839. *Teuthis* Gray = Teuthis.
1854. *Teuthis* Gronow = Siganus.
1854. *Acronurus* Gronow = Teuthis.
1861. *Acronurus* Günther = Teuthis.
1861. *Rhombotides* Bleeker = Teuthis.
1861. *Scopas* Kner = Zebrasoma.
1876. Rhombotides Day = Teuthis.
1876. Ctenodon Day = Ctenochætus.
1876. Harpurus Day = Zebrasoma.
1884. CTENOCHÆTUS Gill.
1884. COLOCOPUS Gill.

A REVIEW OF THE SPECIES OF THE GENUS HÆMULON.

By DAVID S. JORDAN and JOSEPH SWAIN.

In the present paper is given the synonymy of the known species of the genus *Hæmulon* Cuvier, with an analysis of their characters, and redescriptions of the species which have been collected by Professors Jordan and Gilbert.

All the species of *Hæmulon* are American. The genus is very closely related to *Pomadasys*, Lac. (=*Pristipoma*, Cuv.), the only tangible points of difference being the large mouth with curved gape, and the closely

scaled soft dorsal and anal fins. All the species have more or less of orange on the inside of the mouth, a trait of coloration not found in *Pomadasys*. The amount of redness is greatest in those species having the largest mouth. It is true that certain species of *Pomadasys* (*crocro*, *humilis*, &c.), have the mouth larger than in certain species of *Hæmulon* (*tæniatum*, *chrysargyreum*). It is also true that while the soft dorsal and anal in many of the species referred to *Pomadasys* are free from scales, in certain of the subgenera of the latter genus (*Hæmulopsis*, *Anisotremus*) these fins are scarcely less scaly than in *Hæmulon*. It is probably also true that certain species of *Hæmulon* (*tæniatum*) are more closely related to species of the section *Hæmulopsis* of *Pomadasys* (*axillaris*, *nitidus*, *leuciscus*) than this section is to some other species usually placed in the same genus.

There is no doubt, however, that the species of *Hæmulon* form a natural group, and no writer since Desmarest and Cuvier has questioned the right of this group to generic rank.

It has been generally conceded that the group will not admit of further subdivision. The most aberrant of the species (*maculicauda*) was, in 1862, recognized by Dr. Gill as the type of a distinct genus *Orthostæchus*, distinguished by the arrangement of its scales. In 1862 these fishes were the subject of an elaborate study by Mr. Samuel H. Scudder. Nothing has, however, been published by this writer, our knowledge of his conclusions being limited to a nominal list published by Mr. F. W. Putnam. (Bulletin Mus. Comp. Zool., 1863, 12.)

In this list four generic names are recognized, two of them new, but not defined, and hence undeserving of notice. The species are thus grouped:

HÆMYLUM, *formosum* (*plumieri*), *elegans*, *ararà* (*plumieri*).

DIABASIS, *albus*.

ANARMOSTUS, *flavolineatus*, *serratus* (*parræ*).

BATHYSTOMA, *melanurum* (*aurolineatum*), *chrysopterum* (*rimator*).

Later, another genus, *Brachygenys*, likewise left undefined, was proposed by Mr. Scudder for *tæniatum*, Poey. It is mentioned by Poey, (Syn. Pisc. Cubens., 1868, p. 319.)

We are unable to see any distinction whatever for the groups called *Hæmylum*, *Diabasis*, and *Anarmostus*, and think that if these be recognized as genera, most of the remaining species should be elevated to the same rank. *Bathystoma* and *Brachygenys* are better differentiated, but neither in our opinion should be regarded as a distinct genus. No advantage to science comes from such minute generic subdivision.

Most writers have adopted for this genus the very appropriate name of *Hæmulon*, given to it by Cuvier in 1829. This name is not strictly correct in its form, and it has been sometimes written with a greater approach to classical exactness *Hæmulum*, which is an abridgment of the full form, *Hæmatulum*. By a curious blunder several purists have written *Hæmylum*, which is much worse than *Hæmulon*. The name is

expressly stated by Cuvier to be derived from *αἷμα*, blood, and *ὄδλον*, gums.

The name *Diabasis* of Desmarest (1823) has priority over *Hæmulon*, and has been substituted for the latter by Bennett, Bleeker, Jordan and Gilbert and by others. This name is, however, preoccupied* in Coleoptera by the genus *Diabasis*, Hoffmansegg, 1819. There appears, therefore, to be no doubt of the propriety of the retention of the name *Hæmulon*. *Hæmulon sciurus* (Shaw) (*elegans* Cuvier), the first species mentioned by Cuvier, may be regarded as the type of the genus.

Twenty species of *Hæmulon* are recognized by us as probably valid. These we group in five sections or subgenera of rather slight value, for which we adopt the names *Hæmulon*, *Bathystoma*, *Brachygenys*, *Lythrulon*, and *Orthostœchus*. Of these, *Hæmulon* contains most of the species, and exhibits a greater range of variation than the others.

The young fishes in this group differ in proportions considerably from the adults. Besides the changes usual in other fishes we may observe that in *Hæmulon* the young have the snout proportionally much shorter, so that the maxillary, although also shorter in proportion, extends further back in comparison with the eye. Nearly all the species have, when young, two more or less sharply-defined, dark, longitudinal stripes along the side, one or more along the top of the head, and a dark spot at the base of caudal. These markings persist longer in some species than in others, but traces of them, at least, may be found in the young of nearly all the species of *Hæmulon* and *Pomadasys*. In a few species these markings persist during life.

The species are all essentially alike in respect to the pores at the chin, the height and form of the soft dorsal, the form of the nostrils, the squamation of the fins, the direction of the lateral line, &c. These common characters are, therefore, not mentioned in the following descriptions. The peritoneum is black in all species examined:

Synonymy of the genus Hæmulon.

Diabasis, Desmarest† Première Décade Ichthyologique, 1823, 34 (*parræ; flavolineatus;* not of Hoffmannsegg, Coleoptera, 1819; also used in botany).

Hæmulon, Cuvier, Règne Animal, ed. 2, 1829 (*elegans*, etc.).

Orthostœchus, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 255 (*maculicauda*).

Hæmylum, (Scudder MSS.) Putnam, Bull. Mus. Comp. Zoöl., 1863, 12 (*elegans*, etc.).

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*Bleeker, Systema Percarum Revisum, adopts the name *Diabasis*, assigning the date "1818?" The date given on the title page of Desmarest's paper is 1823. It is stated by Desmarest that the paper was read before the Linnæan Society of Paris, December 16, 1822.

†Le poisson que je viens de décrire me paraît, selon les principes de classification ichthyologique de M. Cuvier, devoir former un genre à part. Je lui donne le nom de *Diabasis* Διαβασις (*transitio*) pour indiquer ses rapports, d'une part, avec les *Acanthopterygiens* des genres Lutjan et Pristipome, et de l'autre avec les poissons placés dans la famille des Squamipennes.

DIABASIS, (Scudder MSS., Putnam, *l. c.* (*album*) (name only).
ANARMOSTUS, (Scudder MSS.) Putnam, *l. c.* (name only; *flavolineatum*, etc.).
BATHYSTOMA, (Scudder MSS.) Putnam, *l. c.* (name only: *jeniguano*, etc.).
BRACHYGENYS, (Scudder MSS.) Poey, Synopsis, Piscium Cubensium, 1868, 319 (name only; *tæniatum*).
LYTHRULON, Jordan & Swain (subgenus nova; *flavoguttatum*).
HÆMULON, Cuvier & Valenciennes, Günther, Gill, Steindachner, Poey, Goode et auct.
DIABASIS, Bennett, Bleeker, Jordan & Gilbert, Bean et auct.

ANALYSIS OF SPECIES OF HÆMULON.

a. Scales above lateral line arranged in very oblique series, not parallel with the lateral line.
b. Jaws subequal, or the lower included: mouth little oblique; gill-rakers comparatively few and short.
c. Dorsal spines 12 (sometimes 11 in *H. scudderi*): scales large; gill-rakers few and small (10 to 14 on lower part of anterior arch).
d. Mouth moderate or large, its cleft more than one-third length of head; back more or less elevated; second anal spine strong, notably longer than third (*Hæmulon*).
e. Scales below lateral line anteriorly not especially enlarged.
f. Scales above lateral line anteriorly not much enlarged.
g. Maxillary about two-fifths length of head, not reaching center of eye (in adult).
h. Back and sides without yellow or blue stripes; each scale above with a median blackish spot, these forming undulating lines (spots rarely obsolete); maxillary about 2½ in head.
i. Snout long, pointed, more than two-fifths length of head; preorbital very deep, its least breadth greater than length of eye (in adult); back elevated; profile usually more or less concave above eye; mouth large, the maxillary not reaching front of eye in adult; anal rather high.
j. Sides with about six dark vertical bars; sides of head with blackish spots like the body.... SEXFASCIATUM, 1.
jj. Sides without dark bars; head unspotted.
k. (Color grayish; side with a median longitudinal band from eye to upper part of tail; two or three dark bands above this and one below; second anal spine little longer than third.) MACROSTOMA, 2.
kk. Color pearly or grayish, immaculate, or with small dark spots and a faint dark lateral band; anal fin low, its first soft rays when depressed not reaching tips of last rays; second anal spine longer than third; preopercle finely serrate. GIBBOSUM, 3.
ii. Snout shorter, less than two-fifths length of head; preorbital narrower, its least width not more than length of eye; back elevated; profile not concave; maxillary reaching about to front of eye in adult; spots on scales distinct, forming undulating streaks; head unspotted.

Analysis of species of Hæmulon—Continued.

l. Series of scales from scapular scale extending backward to front of soft dorsal; snout rather long and pointed; mouth small; the maxillary $2\frac{3}{4}$ to 3 in head; dorsal rays XII, 16; pectoral fins long, $\frac{3}{4}$ length of head; black spots on sides coalescing in continuous stripes.

PARRÆ, 4.

ll. Series of scales from scapular scale not extending farther backward than the middle of spinous dorsal; snout shorter, not very acute; mouth larger, the maxillary about $2\frac{1}{3}$ in head; dark spots on scales not coalescent.

m. Depth of body about $2\frac{3}{4}$ in length; pectoral fins short, less than $\frac{3}{5}$ length of head; scales above lateral line scarcely enlarged; dorsal spines 12, the soft rays usually 17.....ACUTUM, 5.

mm. Depth of body $2\frac{1}{3}$ in length; pectoral fins long, more than $\frac{4}{5}$ length of head; dorsal spines usually 11; the soft rays usually 16; scales above lateral line somewhat enlarged (in adult).

SCUDDERI, 6.

hh. Back and sides with persistent black longitudinal streaks: black spots few or none; maxillary between half and two-fifths length of head, about reaching front of pupil in the adult; snout long, about $2\frac{1}{3}$ in head; anal spines strong, the second nearly reaching tip of last ray, its length $2\frac{2}{3}$ in head; body rather deep..FREMEBUNDUM, 7.

hhh. Back and sides with distinct horizontal, orange-yellow stripes, fading, but not disappearing, in spirits; no black spots anywhere; vertical fins usually dusky yellow; scales of sides slightly enlarged; maxillary $2\frac{1}{2}$ in head, reaching front of pupil; body not very deep; snout short, not one-third length of head; second anal spine, when depressed, reaching tip of last ray, its length about half head.

CARBONARIUM, 8.

gg. Maxillary nearly or quite half length of head, reaching center of eye in adult; no black spots or stripes anywhere in the adult (except under angle of preopercle).

n. Back and sides with rows of round, silvery spots, one on each scale, these forming streaks which follow the direction of the rows of scales; anal high, its first soft rays extending, when depressed, beyond base of fin; a black blotch at base of caudal; fins all yellow; body rather elongate, the depth nearly 3 in length; snout pointed; maxillary about $2\frac{1}{3}$ in head; second anal spine longer than third.

STEINDACHNERI, 9.

Analysis of species of Hæmulon—Continued.

nn. Back and sides with continuous yellow stripes, which are horizontal and do not everywhere follow the direction of the rows of scales; ground color bluish gray; back with a well-defined blackish area from base of dorsal to base of caudal, this color covering most of soft dorsal and caudal fins; body rather elongate, the depth 3 in length; snout moderate; longest anal rays when depressed not extending beyond tip of last ray; second anal spine $2\frac{4}{5}$ in head.....MELANURUM, 10.

nnn. Back and sides of head and body with continuous blue stripes, horizontal, and not everywhere following the rows of scales; ground color bright yellow; fins yellow, the caudal dusky at base; snout moderate; teeth very strong, the anterior canine-like; longest soft rays of anal reaching beyond tip of last ray; second anal spine $2\frac{1}{3}$ in head; depth $2\frac{3}{5}$ in length.....SCIURUS, 11.

ff. Scales above lateral line anteriorly much larger than the other scales; sides of head with bright blue stripes, which extend for a short distance only on body; body without distinct markings; mouth very large, its cleft rather more than half head (in adult); anterior profile somewhat concave, the snout sharp, projecting; anal rather high, its second spine $2\frac{1}{3}$ in head...PLUMIERI, 12.

ee. Scales below lateral line anteriorly much enlarged; head, back, and sides with continuous bright yellow stripes, those below following the direction of the scales, and therefore extremely undulating for the most part; fins yellow; posterior teeth canine-like; body rather deep; snout short; mouth not large, the maxillary $2\frac{1}{3}$ in head; anal high, its second spine 2 in head. FLAVOLINEATUM, 13.

dd. Mouth small, its cleft less than one-third length of head; body rather elongate; second anal spine small; back and sides with longitudinal yellow stripes; dorsal spines 12; teeth weak; gill-rakers rather few and small (*Brachygenys*).

o. (Body moderately elongate, the depth more than length of head, about $2\frac{4}{5}$ in body; snout shorter than eye, which is 3 in head, maxillary scarcely reaching front of eye; longest dorsal spine half height of body; anal rather high, its second and third spines subequal; dorsal and caudal fins blackish; other fins yellowish) .....CHRYSARGYREUM, 14.

Analysis of species of Hæmulon—Continued.

oo. Body elongate, the back not elevated, the depth less than length of head, $3\frac{2}{7}$ in body; snout very short, $3\frac{2}{3}$ in head; eye very large, 3; maxillary $3\frac{1}{4}$ in head, reaching little past front of eye; longest dorsal spine more than half depth of body; anal low, its spines small, the second $2\frac{3}{4}$ in head; fins all yellow. TÆNIATUM, 15.

cc. Dorsal spines 13; anal fin low; preorbital low; gill-rakers in moderate or rather large number, 12 to 18 on lower part of arch; lower jaw not projecting; mouth little oblique; body comparatively elongate, the depth $2\frac{3}{4}$ to $3\frac{1}{3}$ in length; body with longitudinal yellowish stripes; scales rather small; size small (*Bathystoma*).

q. Mouth large, the maxillary reaching middle of eye, its length about half head; gill-rakers rather short and few; scales moderate, 50 to 55 in the lateral line; second anal spine scarcely larger than third, $2\frac{3}{4}$ or more in head.

r. Body oblong, the back moderately elevated, the depth $2\frac{3}{4}$ to 3 in length.....RIMATOR, 16.

rr. Body subfusiform, the back little elevated, the depth $3\frac{1}{3}$ to $3\frac{1}{2}$ in length. AUROLINEATUM, 17.

qq. Mouth rather small, the maxillary not reaching to opposite middle of eye, its length not quite half head; gill-rakers numerous, rather long; scales small, about 70 in lateral line; second anal spine notably longer than third, more than $\frac{2}{3}$ length of head; body more elongate than in any other species, the depth about $3\frac{1}{2}$ in length....QUADRILINEATUM, 18.

bb. Lower jaw projecting beyond upper; gill-rakers comparatively long and slender, about 22 on lower part of anterior arch (*Lythrulon*).

t. Mouth small, very oblique, the maxillary reaching pupil, $2\frac{1}{3}$ in head; head short, $3\frac{2}{3}$ in length; snout very short, acute; body rather deep; anal fin very low, its longest ray, when depressed, not nearly reaching middle of last ray; second anal spine little longer than third; scales of back and sides each with a pearly spot, these forming undulating streaks.....FLAVOGUTTATUM, 19.

aa. Scales above lateral line arranged in longitudinal series, which are throughout parallel with the lateral line; dorsal spines 13 (or 14) (*Orthostœchus*).

Analysis of species of Hæmulon—Continued.

u. Body oblong, the depth 3 in length; snout short; mouth small, the maxillary reaching middle of the small eye, its length 2½ in head; eye large; fins low; first soft rays of anal scarcely reaching beyond tips of last rays; second anal spine little larger than third, 2⅔ in head; fourth dorsal spine, 2; sides with alternate stripes of dark brown and light grayish, the latter formed by a light pale spot on the center of each scale; a dark blotch at base of caudal; vertical fins gray. MACULICAUDA, 20.

1. Hæmulon sexfasciatum.

Hæmulon sexfasciatus, GILL, Proc. Ac. Nat. Sci. Phila., 1862, 254 (Cape San Lucas); STEINDACHNER, Ichth. Beitr. iii, 13, 1875 (Panama).

Diabasis sexfasciatus, JORDAN and GILBERT, Bull. U. S. Fish Comm., 1881,324. 1882, 107, 110 (Mazatlan, Panama); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 361, 372, 626 (Cape San Lucas, Colima, Panama); JORDAN, Proc. Ac. Nat. Sci. Phila., 1883, 286 (on Peters's type of *maculosum*).

Hæmulon maculosum, PETERS, Berliner Monatsberichte, 1869, 705 (Mazatlan).

Habitat.—Pacific Coast of Tropical America, Cape San Lucas to Panama.

Head, 3 in length of body, 3¾ in total length with caudal; depth, 2⅖ (3⅛). D. XII, 17. A. III, 9. Scales, * 6–51–14. Length (30997, Colima), 8 inches.

Form of *Hæmulon gibbosum:* Body comparatively deep, the back elevated and compressed, the anterior profile steep and nearly straight from tip of snout to above eye, where a slight angle is formed, thence rising more steeply and forming a somewhat steep curve before the dorsal. Snout pointed, of moderate length, 2¾ in head (in specimen 8 inches in length); proportionately longer in the adult.

Mouth not very large, the maxillary reaching front of eye in young (8 inches), not nearly reaching eye in adult; its length 2½ to 2¾ in head, lower jaw included. Teeth rather slender, the antrorse teeth of posterior part of lower jaw inconspicuous. Eye small (4½ in head in young of 8 inches). Interorbital space convex, about 4 in head. Preorbital deep, its least depth greater than length of eye in adult, 4⅔ in head in young (8 inches). Preopercle finely and rather sharply serrate. Gill-rakers small, about 12 below angle.

* In this paper the scales above the lateral line are counted vertically from the first dorsal spine to the lateral line; those below the lateral line from the first anal spine obliquely upward and forward to the lateral line. The scales in a longitudinal series are, as here given, the number of vertical rows above the lateral line from head to base of caudal. This number is practically the same in all species of the genus, the variations above or below 50 being slight. The number of oblique series of scales, or of pores in the lateral line is in all cases about ten fewer, or about 40.

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Scales moderate, those above lateral line not enlarged, arranged in very oblique series; those below lateral line also not enlarged, their series more nearly horizontal. Soft fins scaled as usual.

Dorsal spines rather slender, the fourth highest, 2 in head; longest soft rays 3 in head. Caudal lobes subequal, $1\frac{1}{3}$ in head; longest anal rays high, $2\frac{1}{3}$ in head; second anal spine longer and a little stronger than third, its tip when depressed about reaching middle of last anal ray; its length $2\frac{3}{5}$ in head; free margin of anal somewhat concave, the tips of the first rays when depressed reaching tips of last rays. Ventral fins, $1\frac{1}{2}$ in head; pectorals, $1\frac{1}{4}$.

Color pearly-grayish, with six or seven sharply defined dusky cross-bands from back to lower part of sides, fading below. These are of nearly equal width, and except the sixth and seventh of about equal distinctness, and extend slightly backward below. They are rather wider than eye, and about equal to the paler interspaces. The first is at the nape, extending to base of pectoral; the second under front of spinous dorsal; the third near middle of spinous dorsal; the fourth under last spines; the fifth and sixth under soft dorsal; the seventh, when evident, on caudal peduncle. Cheeks, opercles, and anterior part of sides with distinct roundish spots of brownish-black; these largest and best defined on the opercle. Fins nearly plain dusky-grayish.

This species is the Pacific coast representative of *Hæmulon gibbosum*, from which it differs most strikingly in its coloration. It reaches a similarly very large size, specimens of upwards of 2 feet in length having been obtained at Mazatlan by Professor Gilbert. It is generally common along the Pacific coast of tropical America.

We have examined the types both of *Hæmulon sexfasciatum* and *Hæmulon maculosum*. There is no doubt of their identity. The very young examples, types of the former species, show the cross-bands of the adult, but not the spots on the head.

2. Hæmulon macrostoma.

Hæmulon macrostoma, GÜNTHER, Cat. Fishes Brit. Mus. i, 308, 1859 (Jamaica).

Habitat.—West Indies.

This species is known to us only from the description of Dr. Günther. It is evidently related to *H. gibbosum*, and may be the young of that species. The coloration and some of the details of the form are, however, different. In coloration and some other respects it approaches *H. fremebundum*, but we cannot reconcile Dr. Günther's description with the specimens of the latter species in the National Museum.

3. Hæmulon gibbosum. *Margate-fish; Jallaó; Margaret Grunt.*

Perca marina gibbosa (the MARGATE-FISH), CATESBY, Nat. Hist. Carolina, p. 2, pl. 2, 1742 (Bahamas).

Calliodon gibbosus, BLOCH & SCHNEIDER, Syst. Ichthyol., 1801, 312 (name and part of description from Catesby; excl. syn. pars).

Hæmulon gibbosum, JORDAN, Proc. U. S. Nat. Mus., 1884, 126 (Key West); BEAN & DRESEL, Proc. U. S. Nat. Mus., 1884, 158 (Jamaica).

Hæmulon album, CUV. & VAL., v., 241, 1830 (St. Thomas); POEY, Repertorio, i, 310, 1867; POEY, Syn. Pisc. Cubens., 1868, 312 (Cuba, Key West); POEY, Enum. Pisc. Cubens., 1875, 45; GÜNTHER, i, 311, 1859 (Jamaica); POEY, Bull. U. S. Fish. Comm., 1882, 118 (Key West).

Diabasis albus, PUTNAM, Bull. Mus. Comp. Zool., 1863, 12 (name only); JORDAN & GILBERT, Syn. Fish. N. A., 924, 1883 (copied).

Hæmulon microphthalmum, GÜNTHER, i, 306, 1859 (America).

Perca chromis, BROUSSONET, MSS.

Hæmulon chromis, CUV. & VAL., v., 242, 1830 (Jamaica).

Hæmulon chrysopterum, GOODE, Bull. U. S. Nat. Mus., v., 1876, 53. (excl. syn).

Habitat.—West Indies; Florida Keys to Brazil.

Head, 3 ($3\frac{3}{5}$); depth, $2\frac{2}{3}$ ($3\frac{1}{3}$). D. XII, 16. A. III, 7. Scales 7 or 8–46 to 48–16. Length, $11\frac{1}{2}$ inches. (D. XII, 18, in a second example; depth, $2\frac{2}{5}$ in a third.)

Body comparatively deep, the back more elevated and more sharply compressed than in any other of our species; the anterior profile steep and nearly straight from tip of snout to above eye, where a slight angle is formed, the profile thence rising more steeply and forming a somewhat steep curve before the dorsal. In most specimens, especially the larger ones, the concavity above the eye is well marked, not, however, in all. Snout long, pointed, its length $2\frac{1}{4}$ to $2\frac{2}{5}$ in head; ventral outline nearly straight; caudal peduncle rather long.

Mouth large, the maxillary extending very nearly to front of eye, its length $2\frac{2}{5}$ to $2\frac{3}{5}$ in head, lower jaw included. Teeth not very large, in narrow bands, the antrorse teeth of the posterior part of lower jaw less developed than in some other species; eye small, 5 to 7 in head; interorbital space strongly convex, its width $3\frac{3}{4}$ in head; preorbital deep, its least breadth $4\frac{1}{8}$ in head; preopercle finely but sharply serrate, the teeth coarser above. In most of the specimens these serrations are distinct, but in one, not otherwise peculiar, they are scarcely distinguishable; gill-rakers rather small, about 12 below the angle.

Scales moderate, those above lateral line not enlarged, arranged in very oblique series; those below more nearly horizontal; soft parts of dorsal and anal covered with thin translucent scales.

Dorsal spines rather slender, the fourth highest, about $2\frac{1}{5}$ in head; longest soft rays 5 in head; caudal lobes subequal, $1\frac{1}{6}$ in head; anal moderate, its longest rays 4 in head; second anal spine stronger and longer than third, $3\frac{1}{5}$ in head, reaching past base of the last ray when depressed; first soft rays when depressed not reaching tips of last rays; ventrals, $1\frac{2}{3}$ in head; pectorals, $1\frac{1}{2}$.

Color in life of adult fishes (1½ to 2 feet in length) pearly white, somewhat olivaceous above, where a few of the scales have very faint dark spots at their bases; still fainter spots visible along the scales of lower part of sides; mouth orange within; lips and a faint blotch on each side of snout light yellow; a dusky shade under edge of preopercle (much more distinct in young); fins all light olive; the soft dorsal somewhat dusky; head without stripes or spots.

Young more distinctly spotted, the spots small, round, blackish, each with a pearly edge; one under each scale of back and sides, very distinct when the fish is alive, or after its scales are removed, but disappearing almost entirely with death. In life a broad dusky lateral band is also distinct, but all traces of this disappear with death. The Cuban specimens are more dusky in color and less distinctly spotted; the coloration above rather brassy than pearly.

In all the species of *Hæmulon* Cuban specimens are decidedly more dusky than those from Key West. In several species, however, certain Cuban specimens are much paler than the average even of Key West examples. This is true notably of *sciurus*, *carbonarius*, and *parræ*. The pale form of *sciurus* has even received a different specific name (*multilineatum*), but we have no doubt that these differences are dependent on character of the water or the bottom, and not on difference of species.

Hæmulon gibbosum reaches a length of two feet or more, and is an important food-fish both at Key West and Havana. English-speaking fishermen everywhere call it Margate-fish, while the Spanish call it Jallaó.

This is evidently the *Hæmulon album* of Cuvier & Valenciennes, and apparently their *H. chromis* also. Günther's *H. microphthalmum*, and apparently his *H. macrostoma* also, belongs to the same species. Poey has suggested that *H. schranki*, Agassiz may have been based on the young of this species, but this supposition seems to us very doubtful, not to say impossible.

The Margate-fish of Catesby, erroneously referred by Linnæus to his *Perca chrysoptera* (*Pristipoma fulvomaculatum*), and by Cuvier to his *Hæmulon chrysopterum* (*aurolineatum*), evidently belongs here.

The *Calliodon gibbosus* of Bloch & Schneider is apparently based on the figure of Catesby, which, together with the *Perca chrysoptera*, L. is quoted in the synonymy.

Schneider has evidently observed the descrepancy between the Linnæn diagnosis of *Perca chrysoptera* and Catesby's figure of the Margate-fish, and has changed the former to make it correspond with the latter. His name *gibbosus* therefore, in our opinion, belongs with the *Hæmulon* rather than with the *Pomadasys*. It has thus priority over the name *album* of Cuvier & Valenciennes. The name *gibbosus* is, of course, suggested by the *Perca marina gibbosa* of Catesby.

4. Hæmulon parræ. *Black Grunt: Ronco Prieto.*

Diabasis parra, DESMAREST, Prem. Décade Ichthyol., 30, tab. 2, f. 2, 1823 (Havana); JORDAN & GILBERT, Bull. U. S. Fish Comm., 1881, 322.

Hæmulon canna ? ? GÜNTHER, i., 311, 1859 (Jamaica; Puerto Cabello); POEY, Repertorio, i., 1867, 309 (not of C. & V.).

Hæmulon caudimacula, CUVIER, Règne Animal, ed. 2, 1829 (on *Uribaco* Marcgrave, and *Diabase de Parra*, Desmarest); CUV. & VAL., v., 236, 1830 (Bahia; Cuba); GÜNTHER, i, 1859, 313 (copied); POEY, Repertorio, i, 1867, 310; SAUVAGE, MSS.; JORDAN & GILBERT, Bull. U. S. Fish Comm., 1881, 322 (redescription of original type).

Hæmulon notatum, POEY, Memorias, ii, 179, 1860 (Cuba); POEY, Synopsis, 317; POEY, Enumeratio, 46.

Hæmulon retrocurrens, POEY, Repertorio Pisc. Cubens., ii, 236, 461, 1868 (Cuba).

Hæmulon continuum, POEY, Enumeratio Piscium Cubensium, 1875, 46 (Cuba); POEY, Anales Soc. Hist. Nat., Madrid, 1881, 210 (Puerto Rico).

Habitat.—West Indies.

Head, $2\frac{4}{5}$ ($3\frac{2}{5}$); depth, $2\frac{2}{3}$ ($3\frac{1}{5}$). D. XII., 15. A. III., 8. Scales, 5–44–10 (40 pores). Length (33,258) 9 inches.

Body oblong, compressed, the back considerably elevated; head rather long; the snout pointed, rather longer and sharper than in *H. acutum*, the anterior profile straight, or a very little concave before the eyes. Snout $2\frac{2}{3}$ in head (in young of 9 inches). Mouth rather small, smaller than in *H. acutum*, the maxillary barely reaching front of eye, its length 3 in head. Teeth of moderate size, the outer and posterior somewhat enlarged. Eye moderate, $4\frac{2}{3}$ in head; interorbital space flattish, its width $4\frac{1}{4}$ in head; preorbital moderate, its least width $4\frac{4}{5}$ in head; preopercle moderately serrate. Gill-rakers few and small, about 12 on lower part of arch.

Scales larger than in *H. acutum* or any other of the species; those above and below lateral line about equal in size; those above arranged in series which are less oblique and more undulating than in related series, the series from the scapular scale following the direction of the lateral line for about 10 scales, then turning abruptly reaching the base of the last dorsal spine, or sometimes the anterior part of soft dorsal; soft fins scaly, as usual.

Dorsal spines of moderate strength, the fourth $2\frac{3}{5}$ in head; longest ray of soft dorsal, 4 in head; caudal, $1\frac{2}{3}$ in head; anal high, the second spine and the longest rays extending, when depressed, well beyond tip of last ray; longest soft ray $2\frac{3}{4}$ in head; second spine longer and stronger than third, $2\frac{2}{3}$ in head; pectorals long, $1\frac{1}{3}$ in head; ventrals, $1\frac{3}{4}$.

Color, in spirits, pearly gray; center of each scale brownish-black, these coalescing and forming very sharply-defined continuous undulating stripes; about 16 of these between front of dorsal and front of anal. The sixth stripe extends from the scapular scale to last dorsal spine. Base of caudal blackish; fins dusky.

This species is known to us only from several specimens in the U. S. National Museum, from different points in the West Indies, to which our attention has been called by Dr. Bean. It is closely allied to *H.*

acutum, differing in the color, in the larger size of the scales, and the differences in their arrangement, and in the longer snout and smaller mouth.

The synonymy of this species and the next is badly entangled, and we are not sure that we have correctly distributed it all. Our fish seems to correspond to *Hæmulon canna* of Günther, and apparently to the *Hæmulon notatum*, *continuum* and *retrocurrens* of Poey. The other names of Poey (*acutum*, *albidum* and *serratum*) seem to refer rather to the next species. This species seems to be the one to which the name *Diabasis parræ* and its synonym *Hæmulon caudimacula* were originally given. It agrees much better than any of the other species with the account of the type of *parræ* and *caudimacula* sent to us by Dr. H. E. Sauvage, and published by us in the Bull. U. S. Fish Comm. 1881, 322. If this identification is correct, the specific name *parræ* is the one to be adopted, having clear priority over all others.

NOTE ON THE DÉCADE ICHTHYOLOGIQUE OF DESMAREST.*

We are indebted to Professor Poey for a copy of this rather rare work. It is in some regards an imitation of the excellent Ichthyologia of Broussonet (1782), and like that work was intended as one of a series of publications which should give detailed descriptions and accurate figures instead of the miserably brief diagnoses which prevailed in zoölogical works at that time. The work of Desmarest compares very favorably with most others published before Cuvier. The descriptions are fair, and the figures, except for a certain uniform snuffy brownness of the coloration, are well executed and characteristic. All the species mentioned by him were collected in Havana by Marcellin Fournier.

The following are the species mentioned with our identification of them:

Trygonobatus torpedinus, p. 6 (pl. 7)† = *Urolophus torpedinus*.
Priacanthus Cepedianus, p. 9 (pl. 1) = *Priacanthus cepedianus*.‡
Lutjanus acutirostris, p. 13 (pl. 3, f. 1) = *Lutjanus caxis*, (Bl. & Schn.).
Lutjanus Aubrieti, p. 17 (pl. 4, f. 1) = *Lutjanus synagris*, (L.).
Umbrina F[*o*]*urnieri*, p. 22 (pl. 3, f. 2) = *Micropogon fournieri*.
Acanthurus Broussonetii, p. 26 (pl. 4, f. 2) = *Acanthurus cœruleus*, Bloch.
Diabasis Parra, p. 30 (pl. 2, f. 2) = *Hæmulon parræ*.
Genus *Diabasis*, p. 34 = *Hæmulon* Cuv.
Diabasis flavolineatus, p. 35 (pl. 22, f. 1) = *Hæmulon flavolineatum*.
Eques punctatus Schneider, p. 40 (pl. 4) = *Eques punctatus*, Schn.
Holocanthus coronatus, p. 44 (pl. 6) = *Holacanthus ciliaris*, (L.).

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*Première Décade Ichthyologique, ou Description complète de dix espèces de Poissons nouvelles, ou imparfaitement connues, habitant la mer qui baigne les côtes de l'île de Cuba. Par M. A.-G. Desmarest. Paris, 1823. Extrait du deuxième volume des Mémoires de la Société Linnéenne de Paris.

†The plates are placed at the end of the memoir without numbers. Their order does not correspond with that intended by the author, who quotes, in the text for *T. torpedinus*, "pl. 1, f. 1," and, for *P. cepedianus*, "pl. 1, f. 2."

‡A species distinct from *P. catalufa*, according to Poey.

5. Hæmulon acutum. *Sailors' choice; Ronco Blanco; Bastard Margaret.*

Hæmulon canna, AGASSIZ, SPIX, Pisc. Brasil., 1829, p. 130, pl. 69 (not of C. & V.)
Hæmulon chromis, GÜNTHER, Cat. Fish. Brit. Mus., i, 310 (Bahia; Jamaica); not of C. & V.
Diabasis chromis, JORDAN & GILBERT, Syn. Fish N. A., 1883, 924 (Garden Key); BEAN, Cat. Fish, Exp., London, 1883, 58 (Garden Key).
Hæmulon acutum, POEY, Memorias de Cuba, ii, 180, 354, 1860 (Cuba); POEY, Synopsis, 315, 1868; POEY, Enumeratio, 45, 1875; BEAN and DRESEL, Proc. U. S. Nat. Mus., 1884, 158 (Jamaica).
Hæmulon albidum, POEY, Memorias, ii, 181, 1860 (Cuba); POEY, Synopsis, 316, POEY, Enumeratio, 46.
Hæmulon serratum, POEY, Memorias, ii, 181, 1860 (Cuba); POEY, Synopsis, 317; POEY, Enumeratio, 46; POEY, Anal. Hist. Nat. Madrid, 1881, 201 (Puerto Rico).
Anarmostus serratus, PUTNAM, Bull. Mus. Comp. Zoöl., 12, 1863 (name only).
Hæmulon parræ, JORDAN, Bull. U. S. Fish Comm., 1884; JORDAN, Proc. U. S. Nat. Mus., 1884, 126 (Key West) (not of Desmarest.)
? *Hæmulon brevirostrum*, GÜNTHER, Fishes, Centr. Amer., 1869, 419 (in part; specimen from Puerto Cabello).

Habitat.—West Indies; Southern Florida to Brazil.

Head, 3 ($3\frac{2}{3}$); depth, $2\frac{2}{3}$ ($3\frac{1}{4}$). D. XII, 17; A. III, 7. Scales, 5–50–14. Length, $10\frac{1}{2}$ inches.

Body comparatively deep, the back compressed and arched; anterior profile rather steep and convex; steep and nearly straight from tip of snout to opposite front of eye; here an obtuse angle is formed, and to the base of dorsal there is a rather even curve. In other specimens there is little or no prominence before eye. Snout comparatively high and obtuse, its length in specimens of moderate size 3 in head. Snout shorter in young specimens than in the adult, the maxillary in the young extending farther back although proportionately shorter. Mouth rather small for the genus, the maxillary usually extending a little beyond vertical from front of eye, in young nearly to middle of eye, its length $2\frac{3}{7}$ in head; maxillary in adult barely reaching front of eye. Jaws subequal, the lower slightly included. Teeth rather strong, in moderate bands, the outer large, the antrorse teeth of the posterior part of lower jaw well developed.

Eye large, 4 in head. Interorbital space convex, its width $4\frac{1}{3}$ in head. Preorbital rather deep, its least breadth $5\frac{2}{3}$ in head. Preopercle finely but sharply serrate, the teeth near the angle further apart than the others but scarcely larger. In regard to the serration of the preopercle we find much variation among our specimens, some of those from Cuba corresponding more or less perfectly to *serratum*, Poey, have the preopercle always strongly serrate, while others, certainly corresponding to *acutum*, Poey, have the serrations very inconspicuous. The Key West specimens are in this respect mostly intermediate, and none of them show any other distinctive character correlated with the differences in the preopercle.

Gill-rakers small, about 15 on lower part of arch. Scales rather large,

those above lateral line not especially enlarged, arranged in very oblique series; those below more nearly horizontal; soft fins well scaled. Series of scales from scapular scale reaching fourth to sixth dorsal spine.

Dorsal spines stout, the fourth highest, $2\frac{1}{3}$ in head; longest soft rays $3\frac{3}{4}$ in head. Upper caudal lobe rather longest, $1\frac{2}{3}$ in head; longest anal rays $2\frac{1}{3}$ in head, reaching when depressed beyond the tips of the last rays. Second anal spine stronger and longer than third, $2\frac{2}{5}$ in head, reaching when depressed nearly to the tip of the last ray. Ventrals, $1\frac{5}{6}$ in head; pectorals short, $1\frac{4}{7}$.

Color in life, dull pearly grayish; belly, plain grayish, each scale on body above with a conspicuous spot of dull olive-brown, these forming interrupted, oblique, and wavy streaks; head not spotted; mouth not much red, usually faintly orange near the angle in young specimens, a black spot on opercle under angle of preopercle; iris gilt; fins all dull, blackish-gray, the ventrals more or less tipped with blackish.

Younger specimens have dark lateral stripes arranged precisely as in *H. fremebundum* and *H. rimator* and also a dark blotch at base of caudal. In the very young the spots on the scales are indistinct. Cuban specimens are mostly more dusky in color, the vertical fins mostly black, and the spots on the scales larger and almost black. In some these spots coalesce into stripes, but more usually they remain distinct. Other Cuban specimens (*albidum*) are very pale, the dark spots light brown, and specimens of every intermediate shade are in the collection. There are never any shades of blue or yellow on body or fins.

This species is common at Key West, where it is known as Sailor's Choice. It is not very often brought into the market, on account of its rather small size. The young are abundant along the shores, in numbers inferior only to *H. plumieri* and *H. rimator*. At Havana it is still more common, being brought into the market in large numbers every day. The darker specimens are called by the fishermen *Ronco prieto*, the paler ones *Ronco blanco*.

While in Havana, Professor Jordan took especial pains to select specimens representing every variety of form and coloration in this species. In the very large collection secured we find specimens answering fairly to Poey's *serratum*, *albidum*, *Hæmulon acutum* as well as other specimens variously intermediate. A type of *Hæmulon acutum* sent by Poey to the United States National Museum is identical with the types of our description. *H. chromis* of Günther is also certainly this species, but the original *chromis* of Broussonet and Cuvier seems to have been *H. gibbosum*.

If our view of the identity of these various nominal species with black spots be correct, the name *acutum* is the one to be retained. It is not impossible that the synonymy given above may be found to include more than one distinct species. If the identity of *Hæmulon canna*, Agassiz, with this species is regarded as certain, the name *canna* should supercede *acutum*. Its use by Agassiz is prior to its application to a differ-

ent species by Cuvier, although *canna* was originally a manuscript name of the latter author.

6. **Hæmulon scudderi.** *Mojarra prieta.*

Hæmulon scudderi, GILL, Proc. Ac. Nat. Sci. Phila., 1862, 253 (Cape San Lucas); STEINDACHNER, Ichth. Beitr. iii, 18, 1875.

Diabasis scudderi, JORDAN & GILBERT, Bull. U. S. Fish Comm., 1881, 324; 1882, 107, 110, (Mazatlan, Panama); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 361, 626 (Cape San Lucas, Panama.)

Hæmulon brevirostrum, GÜNTHER, Fishes Centr. Amer., 1869, 418, (Panama ? ? Puerto Cabello.)

Hæmulon undecimale, STEINDACHNER, Ichth. Beitr. iii, 1875, 11, (Acapulco, Panama).

Habitat.—Pacific coast of tropical America; Cape San Lucas to Panama.

Head, $3\frac{1}{8}$ ($3\frac{4}{5}$); depth, $2\frac{1}{2}$ ($3\frac{1}{8}$). D. XI, 16 (sometimes XII, 15). A. III, 7. Scales, $5\frac{1}{2}$–49–13. Length (29282, U. S. Nat. Mus., Panama) $9\frac{1}{2}$ inches.

Body short and deep, still deeper than in *H. acutum*, the back compressed and arched; anterior profile very steep and nearly straight from the tip of the snout to the nape, then evenly convex. Snout low and short, but not obtuse, its length in specimens of moderate size, 3 in head.

Mouth comparatively small, the maxillary extending in adult barely to front of pupil, its length $2\frac{1}{2}$ in head. Lower jaw slightly included. Teeth moderate, the posterior teeth of lower jaw largest.

Eye large, 4 in head. Interorbital space convex, its width $3\frac{3}{5}$ in head. Preorbital rather deep, its least breadth 5 in head. Preopercle rather strongly serrate; the teeth near the angle larger and farther apart than the others.

Gill-rakers rather small, about 5 on lower part of arch.

Scales rather large; those above lateral line somewhat enlarged, notably larger than those below, and arranged in very oblique series; series of scales from scapular scale reaching fifth dorsal spine. Soft fins well scaled.

Dorsal spines stout; the fourth highest, 2 in head; longest soft rays, $3\frac{1}{8}$ in head; upper caudal lobe, $1\frac{2}{3}$; longest anal rays, $2\frac{1}{2}$ in head, reaching when depressed beyond the tip of the last rays, the free margin of the fin straight. Second anal spine longer and stronger than third, $2\frac{1}{10}$ in head, reaching when depressed nearly to the tip of the last ray. Ventrals, $1\frac{1}{2}$ in head; pectorals long, $1\frac{1}{10}$.

Coloration precisely as in *Hæmulon acutum* and undergoing the same changes with age. Adult dull pearly grayish, light or dark, with a roundish dusky blotch at base of each scale of back and sides, these not coalescent, but forming dark interrupted lines in the direction of the rows of scales. Head unspotted, a black blotch under angle of preopercle. Fins dusky grayish, the pectorals palest.

This species is the Pacific representative of *Hæmulon acutum*. It reaches a similar size, is equally abundant, and passes through a similar range of variations and coloration.

Most of the specimens collected by Professor Gilbert at Mazatlan and Panama have 11 dorsal spines and correspond to the *Hæmulon undecimale* of Steindachner. Two or three of them have, however, 12 dorsal spines, as in the original types of *H. scudderi* and *H. brevirostrum*. We are unable to detect any other difference of importance among these specimens, and refer all to *H. scudderi*, regarding it as a species with the number of spines indifferently 11 or 12. No other species of *Hæmulon* ever has fewer spines than 12. If these should finally prove to be specifically distinct, the form with 11 spines should stand as *Hæmulon undecimale*, that with 12 spines as *Hæmulon scudderi*. The above description is especially taken from a specimen of the *undecimale* type.

7. Hæmulon fremebundum.

Hæmulon fremebundum, GOODE & BEAN, Proc. U. S. Nat. Mus., 1879, 340 (Clear Water Harbor, Florida: Young); BEAN & DRESEL, Proc. U. S. Nat. Mus., 1884, 159 (Jamaica).

Diabasis fremebundus, JORDAN & GILBERT, Synopsis Fish. N. A., 1883, 553 (copied); BEAN, Cat. Fishes Exh. London, 1883, 57 (Garden Key, Florida).

?? *Hæmulon macrostoma*, GÜNTHER, i, 308, 1859 (Jamaica).

Habitat.—Southern Florida to Jamaica.

Head, $2\frac{4}{5}$ ($3\frac{3}{5}$); depth, $2\frac{3}{4}$ ($3\frac{1}{3}$). D. XII, 16. A. III, 8. Scales, 7–51–13 (9 above in an oblique series). Length (26555 U. S. Nat. Mus., Key West), 9 inches.

Body oblong, moderately compressed, the anterior profile almost straight, snout rather long and pointed, its length $2\frac{1}{3}$ in head. Eye large, $3\frac{4}{5}$ in head. Mouth rather large, the maxillary reaching front of pupil, $2\frac{1}{6}$ in head. Least width of preorbital about 5 in head. Teeth moderate, the outer row in the upper jaw and the posterior teeth in both jaws considerably enlarged. Preopercle moderately serrate. Gill-rakers small.

Scales moderate, those above lateral line not enlarged; those below very slightly enlarged; scales above arranged in very oblique series, the series below oblique anteriorly becoming horizontal posteriorly.

Dorsal spines strong, the longest $2\frac{1}{4}$ in head; soft dorsal rather high. Caudal lobes subequal, $1\frac{2}{3}$ in head. Anal spines strong, the second longest and strongest, $2\frac{2}{3}$ in head, its tip reaching, when depressed, beyond tip of last ray. Soft anal very high, its free margin concave, its longest ray, $2\frac{3}{5}$ in head, reaching much beyond tip of last ray. Pectorals, $1\frac{3}{5}$ in head. Ventrals, $1\frac{2}{3}$.

Color, in spirits, pearly gray, with conspicuous narrow dark streaks, arranged essentially as in the young of all the other species of *Hæmulon*, but in this species persistent through life. A median streak from tip of snout to dorsal, one from snout above eye, along sides of back, to

last ray of soft dorsal, two below this from eye above to last ray of soft dorsal, the upper one more or less interrupted behind. A fourth streak from eye nearly straight to base of caudal; traces below this of a fifth streak. A short streak from eye to gill opening, between the third and fourth streaks; this is continued on the body in a series of irregular marks and dots. A large black blotch on opercle under angle of preopercle. Fins all dusky olive, the pectorals palest, ventrals darkest.

The above description is taken from a specimen in the United States National Museum (26555), collected at Key West, in 1880, by Mr. Silas Stearns. Another specimen from Jamaica has been recorded by Dr. Bean. The original types from Clearwater Harbor, Florida, and some other specimens in the National Museum, from Garden Key, Florida, are very immature, but to all appearance are identical with the two larger examples.

These specimens are all at present recorded as belonging to *H. fremebundum*, and none of the earlier names or references seem to belong to the species. We have placed in the synonymy *Hæmulon macrostoma* of Günther with much doubt, thinking it unlikely that the two species can be identical. *Hæmulon fremebundum* must be a rare species. It was not obtained by Professor Jordan either at Key West or Havana, and none of Poey's accounts seem to refer to it.

We are indebted to Dr. Bean for calling our attention to the characters which distinguish this species from *H. acutum*.

8. Hæmulon carbonarium. *Ronco Carbonero.*

Hæmulon carbonarium, POEY, Memorias de Cuba, II, 176, 1860 (Cuba); POEY, Synopsis, 1868, 318; POEY, Enumeratio, 44, 1875.

Habitat.—Coasts of Cuba.

Head, 3 ($3\frac{3}{4}$); depth, $2\frac{4}{5}$ ($3\frac{3}{5}$). D. XII, 16. A. III, 8. Scales, 7 – 55 – 14. Length, 9 inches.

Body oblong; the back not greatly elevated; the profile nearly straight or slightly convex from tip of snout to above eye; thence gibbous to front of dorsal; snout short, moderately pointed, its length $3\frac{1}{6}$ in head.

Mouth not very large; the gape somewhat curved; the maxillary extending nearly or quite to front of pupil, its length $2\frac{1}{2}$ in head. Lower jaw rather included. Teeth strong, much as in *H. sciurus*, but a little shorter.

Eye large, $3\frac{2}{3}$ in head; interorbital space flattish, 4 in head; preorbital moderate, its least breadth 6 in head; preorbital finely but rather sharply serrate; gill-rakers small.

Scales moderate, those below lateral line anteriorly moderately enlarged, their series nearly horizontal; series above lateral line very oblique.

Dorsal spines slender and high, the fourth, $1\frac{7}{8}$ in head; longest soft rays, $3\frac{1}{2}$; upper caudal lobe a little longer than lower, $1\frac{1}{5}$ in head;

longest anal rays, $2\frac{1}{3}$ in head, their tips when depressed reaching beyond the tips of the last rays; second anal spine strong, 2 in head, its tip reaching when depressed about to the tip of the last soft ray; ventrals, $1\frac{1}{2}$ in head; pectorals, $1\frac{2}{7}$.

Color in life light bluish-gray, much as in *plumieri;* body with 7 or 8 deep brassy-yellow stripes which are horizontal above, those below the lateral line a little curved, following the rows of scales; stripes narrower than interspaces of ground-color; 3 stripes above lateral line, 3 or 4 below, the latter paler; little black under angle of preopercle; caudal blackish-yellowish at tip; soft dorsal, anal, and ventrals yellowish-gray, the distal portion blackish; spinous dorsal bluish, deep yellow at base and edge; a yellowish stripe along middle of fin; pectoral plain, a yellowish bar across its base; mouth deep red, its angle duskish.

In spirits this fish is grayish, more or less shaded with dusky, the stripes rather faint orange-brown.

A few specimens of this species have the ground-color much paler, the yellow stripes lighter, and the fins all bright yellow without dusky shades. All these were procured of the same fisherman. They probably represent a variation due to the character of the bottom, and are apparently analogous to the form of *H. sciurus*, which has been called *H. multilineatum.*

This species is common at Havana, where it is known as Ronco Carbonero. It reaches a length of about 10 inches. It has not yet been noticed outside of Cuba, unless *Hæmulon schranki* or some of the names of Cuvier referred by us to the synonymy of *H. flavolineatum* should prove to belong here. The relations of this species are probably rather with *H. flavolineatum* than with *H. sciurus.*

9. Hæmulon steindachneri.

Hæmulon schranki, AGASSIZ, SPIX, Pisc. Brisil., 1829, 121, pl. 69.

Hæmulon caudimacula, STEINDACHNER, (Brazil), Ichthyol. Beiträge, iii, 15, 1875 (Acapulco, Rio Janeiro, Rio Grande do Sul, Maranhaõ; not of Cuv. & Val.).

Diabasis steindachneri, JORDAN & GILBERT, Bull. U. S. Fish. Comm., 1881, 322 (Mazatlan, Panama); JORDAN & GILBERT, Bull. U. S. Fish. Comm., 1882, 107, 110 (Panama; Mazatlan); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 361, 372 (Cape San Lucas, Colima).

Hæmylum flaviguttatum, BEAN, Proc. U. S. Nat. Mus., 1880, 96 (Colima; no description; not of Gill).

Habitat.—Pacific coast of tropical America; coast of Brazil.

A species of small size, generally common on the Pacific coast of tropical America. According to Steindachner it also occurs in abundance on the southeast coast of Brazil.

As this species has been already fully described in the Bulletin of the U. S. Fish Commission, no further notice of it is necessary here.

The very unsatisfactory description and figure of *H. schranki*, Agassiz

do not permit us to identify the species. It resembles the present species as much as any, but not enough to lend even probability to an identification.

10. **Hæmulon melanurum.** *Jeniguana.*

Perca marina cauda nigra (the BLACK-TAIL), CATESBY, Hist. Carolina tab. 7, f. 2 (Bahamas).

Perca melanura, LINNÆUS, Syst. Nat., x, 292, 1858; xii, 486, 1766 (based on Catesby's figure); GMELIN, Syst. Nat., 1788, 1319.

Bathystoma melanurum, PUTNAM, Bull. Mus. Comp. Zoöl., 1863, 12 (name only).

Hæmulon melanurum, COPE, Trans. Am. Philos. Soc., 1871, 471 (New Providence, St. Martin's, St. Croix).

Hæmulon dorsale, POEY, Memorias, ii, 179, 1860 (Cuba); Synopsis, 1868, 308; Enumeratio, 1875, 44).

Habitat.—West Indies.

Head, 3 ($3\frac{3}{4}$); depth, 3 ($3\frac{3}{4}$). D. XII, 16; A. III, 8. Scales, 6–50–15. Length, 10 inches.

Body comparatively elongate, the back not much elevated, the profile slightly convex from tip of snout to front of eye; thence more convex to front of dorsal. Snout of moderate length, rather pointed, $2\frac{3}{4}$ in head.

Mouth rather large, the gape a little curved, the maxillary reaching past front of pupil, its length 2 in head; teeth moderate, those in front somewhat enlarged; antrorse teeth of posterior part of jaws not very large.

Eye moderate, 5 in head; interorbital width, 4; preorbital low, its least breadth 7 in head; gill rakers, small.

Scales moderate, those above lateral line not enlarged, their arrangement about as in *D. elegans.*

Dorsal spines rather slender, the fourth, $2\frac{1}{5}$ in head. Upper caudal lobe, $1\frac{1}{3}$ in head. Longest anal rays, 3 in head; their tips, when depressed, not extending beyond last ray. Second anal spine, $2\frac{3}{4}$ in head, reaching, when depressed, rather beyond middle of last ray. Ventrals, $1\frac{3}{4}$ in head; pectorals, $1\frac{1}{2}$.

Color in life, pearly gray. Back and sides with about ten horizontal stripes of golden yellow, narrower than the interspaces of the ground color. Snout above bluish dusky. A dusky stripe through eye from tip of snout to behind gill opening. A well-defined black area on back and caudal fin, bounded below by an almost straight line from first dorsal spine to tip of lower caudal lobe; middle part of both caudal lobes black, the edges gray. A black spot under angle of preopercle; mouth within very red; pectoral, ventrals, and anal gray, not yellow. Soft dorsal dusky along the base.

This species is rather common at Havana, where it is known as *Jeniguana.* It reaches a length of about a foot. There seems to be little doubt

of its identity with the Black-tail of Catesby, on which is based the *Perca melanura* of Linnæus. Goode has, however, identified this, without good reason, it seems to us, with the Yellow-tail of the fishermen, *Lutjanus chrysurus*.

11. Hæmulon sciurus. *Yellow grunt; Ronco Amarillo.*

Anthias formosus, BLOCH, Ichthyol., taf. 323, about 1795, (Antilles); BLOCH & SCHNEIDER, Syst. Ichthyol., 1801, 305. (Not *Perca formosa* L., with which it is identified; the latter is *Serranus (Diplectrum) formosus.*)

Sparus sciurus, SHAW, General Zoölogy, iv, 1803, pl. 64 (based on the description and figure of Bloch).

Hæmulon sciurus, JORDAN, Proc. U. S. Nat. Mus., 1884, 126 (Key West).

Hæmulon elegans, CUVIER, Règne Animal, 1829 (no description; on the figure of Bloch); CUV. & VAL., v, 227, 1830; GÜNTHER, i, 1859, 306 (Jamaica); PUTNAM, Bull. Mus. Comp. Zoöl., 1863, 12 (name only); POEY, Repertorio, i, 309, 1867; COPE, Trans. Am. Philos. Soc., 1871, 471 (St. Croix).

Diabasis elegans, JORDAN & GILBERT, Syn. Fish. N. A., 923 (specimen from Aspinwall); BEAN, Cat. Fish. Exh., London, 1883, 58 (Key West).

Diabasis obliquatus, BENNETT, Zoölogical Journal, London, v, 1835, 90 (Jamaica).

Hæmulon luteum, POEY, Memorias, ii, 174, 354, 1860 (Cuba); POEY, Synopsis, 317; POEY, Enumeratio, 44; POEY, Anales, Hist. Nat., Madrid, 1881, 201, (Puerto Rico).

Hæmulon multilineatum, POEY, Memorias, ii, 178, 1860 (Cuba); POEY, Synopsis, 318; POEY, Enumeratio, 44.

Habitat.—West Indies; Florida Keys to Brazil.

Head $2\frac{3}{4}$, ($3\frac{1}{2}$); depth $2\frac{3}{5}$, ($3\frac{1}{3}$). D. XII, 16; A. III, 8. Scales, 7–53–14. Length, 10 inches.

Body oblong; the back not specially elevated; the profile nearly straight or slightly concave from tip of snout to before eye, thence a little gibbous to base of dorsal; snout moderately acute, $2\frac{1}{2}$ in head.

Mouth large, the gape curved, the maxillary reaching a little past front of pupil, its length 2 in head; lower jaw slightly included; teeth strong; upper jaw in front, with about three strong canines on each side, these stronger than any of the other teeth; front teeth of lower jaw rather strong, as also the antrorse teeth of the back part of both jaws.

Eye moderate, 4 in head; interorbital space convex, $3\frac{5}{6}$ in head; preorbital moderate, its least breadth $6\frac{2}{3}$ in head; preopercle finely serrate; gill-rakers small, about 17 below angle.

Scales moderate, those above lateral line, not at all enlarged, arranged in oblique series, those below in nearly horizontal ones.

Dorsal spines rather slender, the fourth longest, $2\frac{2}{5}$ in head; longest soft rays, 4; upper caudal lobe longer than lower, $1\frac{1}{3}$ in head; longest anal rays, $2\frac{1}{4}$ in head, their tips, when depressed, extending beyond the tips of the last rays. Second anal spine stronger and longer than third, $2\frac{1}{3}$ in head, its tip, when depressed, reaching past the middle of the last ray; ventrals, $1\frac{2}{3}$ in head; pectorals, $1\frac{2}{5}$.

Color in life deep brassy yellow, scarcely paler below or darker above; head and body with about 12 conspicuous slightly wavy, longitudinal stripes of sky-blue, deepest on the snout, each with a very narrow edge of dusky olive; these stripes on the head curving upward below eye, the first stripe below eye forking near the posterior margin of preopercle and inclosing an oblong area of the ground color; iris gilt, a dark spot under the angle of preopercle; spinous dorsal, edged and shaded with yellowish, its membrane mostly bluish. Soft dorsal yellowish; caudal yellowish, broadly dusky at base, the degree of this duskiness being variable; mouth deep orange within; pectorals pale yellowish; anal and ventrals deeper yellowish. The young have more yellow on fins and less on body, with traces of a dark caudal spot. The coloration becomes fainter in spirits, the blue lines becoming gray.

Specimens from Cuba are slightly darker, but not otherwise different. Among them are two which evidently correspond to *Hæmulon multilineatum* of Poey. These, in life, showed the following coloration: Clear bright yellow, with brassy tinge, the stripes clear sky-blue, without darker edge; iris yellow, no black at base of caudal. Mouth deep red, no black under angle of preopercle; fins yellow; pectorals and ventrals little yellow. Color in life notably different from that of *Hæmulon sciurus*, but the difference consists really in the absence of dusky shading, and disappears entirely in spirits, these specimens being now scarcely distinguishable from the ordinary *sciurus*.

This species is common both at Key West and Havana, and is known as "Yellow Grunt" or "Ronco Amarillo." It is sometimes called "Boar Grunt" by fishermen who imagine it to be the male of *H. plumieri*.

This species was first noticed by Bloch, who called it *Anthias formosus*, identifying it incorrectly with *Perca formosa* of Linnæus. This name is changed by Shaw, who, still supposing it to be *Perca formosa* of Linnæus, changes the name arbitrarily to *Sparus sciurus*. A fair description and figure are given, taken, we believe, from Bloch. In our opinion the name *sciurus* should be retained for the species, although so far as Shaw was concerned its introduction was a piece of meddling impertinence. Shaw's synonymy includes the Linnæan fish, and the name *sciurus* is taken from the common name (*Squirrel-fish*) of the latter. The species which he had in mind is, however, the present one, and it had before him received no tenable specific name. This confusion was first detected by Cuvier, who, however, failed to discriminate between the Linnæan type (*Serranus formosus*) and the figure of Catesby (representing *Hæmulon plumieri*), referred by Linnæus to the same species. Cuvier called the species *elegans*. Later Poey, on the basis of inaccuracies in coloration in a plate representing *H. elegans*, has considered the Cuban fish as distinct under the name of *luteum*, while a pale variety discussed above has been called *multilineatum*. There is no doubt that both these names should be regarded as synonyms of *elegans*.

The *Diabasis obliquatus** of Bennett is much more like this species than any other of the genus yet known. We think that it belongs here, although the blue stripes are represented as more oblique and more numerous than we have ever seen them.

12. Hæmulon plumieri. *Common Grunt; Ronco ronco.*

Guaibi Coara Brasiliensibus, MARCGRAVE, Hist. Bras., 1648, 163, (Brazil).

Perca marina capite striato (the GRUNT), CATESBY, Hist. Carolina, &c., tab. 6, 1743. (Bahamas, &c.)

Labrus plumieri, LACÉPÈDE, Hist. Nat. Poiss., iii, 480, 1802, pl. 2, f. 2 (on a copy of a drawing by Plumier, identified with this species by Cuvier).

Diabasis plumieri, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 603 (Charleston); JORDAN & GILBERT, Syn. Fish. N. A., 1883, 971; BEAN, Cat. Fishes Exh., London, 1883, 58 (Key West).

Hæmulon plumieri, JORDAN, Proc. U. S. Nat. Mus. 1884, 126 (Key West).

Hæmulon formosum, CUVIER, Règne Animal; CUVIER & VALENCIENNES, v., 1830, 230 (Martinique); GÜNTHER, i, 305, 1859 (Pernambuco, Jamaica); DE KAY, New York Fauna, 1842, 86 (? New York); COPE, Trans. Am. Phil. Soc., 1871, 470 (St. Croix; New Providence) (not *Perca formosa* L.).

Hæmylum formosum, PUTNAM, Bull. Mus. Comp. Zoöl., 1863, 12 (name only).

Diabasis formosus, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 276 (Pensacola); JORDAN & GILBERT, Synopsis N. A., 553.

Hæmulon arcuatum, CUV. & VAL., ix, 481, 1833 (Charleston); HOLBROOK, Ichth. S. Car., 1860, 124, pl. xvii (Charleston); GOODE, Proc. U. S. Nat. Mus., 1879, 113 (St. Augustine; no descr.); BEAN and DRESEL, Proc. U. S. Nat. Mus., 1884, 158 (Jamaica.)

Hæmulon arara, POEY, Memorias, ii, 1860, 177 (Cuba); POEY, Synopsis, 1868, 318; POEY, Enumeratio, 45, 1875.

Hæmylum arara, PUTNAM. Bull. Mus. C. Z., 1863, 12 (name only).

Hæmulon subarcuatum, POEY, Memorias, ii, 1860, 419 (Cuba); POEY, Synopsis, 1868, 318; POEY, Enumeratio, 1875, 45.

Habitat.—West Indies; South Carolina and West Florida to Brazil. Head, $2\frac{2}{3}$ ($3\frac{1}{4}$); depth, $2\frac{2}{3}$ ($3\frac{1}{4}$). D. XII, 1.6; A. III, 8. Scales, 5–50–17. Length, 8 inches.

Body moderately elongate, the back elevated and somewhat compressed. Head long the snout sharp and projecting, its length, $2\frac{1}{5}$ in head. Anterior profile more or less S-shaped, nearly straight from tip

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* The following is Bennett's original description, for a copy of which we are indebted to Dr. Edw. J Nolan, of Philadelphia:

"DIABASIS OBLIQUATUS.—Diabasis flavescens, capite vittis cœruleis duodecim, corpore lineis cœruleis obliquis numerosis. D. $\frac{12}{16}$; P. 16; V. $\frac{1}{6}$; A. $\frac{3}{12}$; C. 16.

"On a yellowish, somewhat fuscous, ground (perhaps altered by the spirit in which the specimen has been immersed for about three months) the markings are pale blue, in numerous vittæ; those on the head and opercula, which are somewhat broader and more deeply coloured than those of the body, are nearly longitudinal, about twelve in number; those of the body are oblique, directed upwards and backwards. The latter are formed by lines passing across the middle of each scale, and are consequently numerous, not less than sixteen or seventeen being crossed by a line drawn from the junction of the spinous and soft portions of the dorsal fin to the belly in front of the anus. On the tail, behind the dorsal and anal fins, the markings become longitudinal, in about nine rows. The fins, especially their scaly, soft portions, are more fuscous than the body; into these the markings do not extend. The lateral line, de-

of snout to before eye, there concave and thence gibbous to the front of dorsal, old specimens having the nape more gibbous than young ones.

Mouth very large, the gape curved. Maxillary reaching to a little beyond front of eye, its length $1\frac{7}{8}$ in head; lower jaw slightly included. Teeth strong, in rather broad bands, those of the outer series enlarged; antrorse teeth of posterior part of both jaws strong.

Eye small, 5 to 6 in head. Interobital space convex, 4 in head. Preorbital rather deep, its least breadth 6 in head. Preopercle finely serrate.

Gill-rakers small, about 15 below angle. Scales rather large, those above lateral line anteriorly very much enlarged, arranged in irregular and very oblique series, those below also oblique.

Dorsal spines stout, the fourth longest, $2\frac{2}{5}$ in head; longest soft rays, $3\frac{3}{4}$ in head; caudal lobes subequal, 2 in head; longest anal rays, $2\frac{4}{5}$ in head, their tips when depressed about reaching tips of the last rays. Second anal spine stronger and longer than third, $2\frac{1}{2}$ in head, its tip when depressed at least reaching middle of last ray. Ventrals, $1\frac{3}{4}$ in head; pectorals $1\frac{1}{2}$.

Color in life bluish-gray, the base of the scales above bright bronze, tinged with olive. Bases of scales below lateral line also bronze, this color forming very oblique stripes running upward and backward; anterior region above lateral line with three or four sky-blue stripes, ill defined, apparently continuations of stripes of head. Head golden-bronze with many narrow stripes of deep clear blue, as if painted on, these nearly horizontal, except before eye, where a few curved ones cross the forehead; also these lines curve slightly upward below eye. Lips dusky. Inside of mouth deep orange, bordered anteriorly on the jaws by yellow; a greenish bar on opercle, partly concealed by the preopercle. Dorsal grayish, with a narrow yellow edge on spinous portion; caudal, plain gray; anal, gray, tinged with yellow; ventrals, gray, with a clear blue luster, which disappears after death; pectorals, gray, a dusky bar at base. There is considerable variation in the depth of color in this species. The young is similar to the adult in color, but has traces

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flected opposite to the extremity of the dorsal fin, is yellow, and is accompanied below by a blue line; a similar line, but more distinct, passes along its upper edge. The caudal fin is forked; the spines of the dorsal are filamentous.

"The front and the extreme teeth in each jaw, especially in the upper, are longer and stronger than the others, and are somewhat hooked, a variance from the generic mark 'dents en velours' indicated by M. Cuvier. His characters may be erroneous in this respect, or the structure may be peculiar to the present species, the only one of the genus I have yet examined.

"In this description I have omitted several points which form part of the generic marks indicated by M. Cuvier, whose name for the genus (*Hæmulon*) should give way before the prior claim of that of *Diabasis*, proposed by M. Desmarest. It is to be feared, however, that in such a case the weight M. Cuvier's authority will bear down all opposition, and that even the principles of nomenclature, if he persists in retaining the appellation he has proposed, will in vain be urged against one who has engaged in his favor the gratitude of every ichthyologist."

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of two lateral bands, and a dusky caudal spot. The color in spirits differs only in the blue becoming dusky.

This species is the "Grunt" par excellence of our South Atlantic coast. It is not rare in West Florida and on the Carolina coast, while at Key West it is the most abundant food-fish, the amount taken during the year exceeding that of all other shore species combined. At Havana it is proportionally much less common, though still the most abundant of its genus. It does not usually exceed a foot in length, although individuals 18 inches long are sometimes taken. These large Grunts have the back and nape more elevated, and correspond to Cuvier's *H. arenatum*.

This species was well represented by Catesby, but Linnæus has referred Catesby's figure to the synonymy of his *Perca formosa*, which is a *Serranus*. From this mistake it has come that the name *formosum* has been transferred from the *Serranus* to the *Hæmulon*. This is inadmissible. The oldest name ever actually given to this species is that of *Labrus plumieri*, Lacépède. This name is based on a rough copy of a drawing by Plumier. Cuvier, who had examined this drawing, referred it to the present species, so that there seems to be no doubt that the name *plumieri* belongs here. Poey's *H. subarcuatum* seems to be a color variety of his *H. arara*, which is the ordinary *plumieri*.

13. Hæmulon flavolineatum. *French Grunt; Open-mouth Grunt; Ronco Condenado.*

Diabasis flavolineatus, DESMAREST, Prem. Décade Ichth., 1823, 35, pl. 2, f. 1; DESMAREST, Dictionnaire Classique, v., 235, about 1825, tab. 98, f. 1 (Cuba).

Anarmostus flavolineatus, PUTNAM, Bull. M. C. Z., 1863, 12 (name only).

Hæmulon flavolineatum, POEY, Repertorio, i, 309, 1867; POEY, Synopsis, 318; POEY, Enumeratio, 45; JORDAN, Proc. U. S. Nat. Mus., 1884, 126 (Key West).

Hæmulon heterodon, CUVIER, Règne Animal, ed. 2, 1829 (*Diábase rayée* of DESMAREST); CUV. & VAL., v, 1830, 255 (Martinique); POEY, Repertorio, i, 1867, 309.

? Hæmulon canna, CUV. & VAL., v, 253, 1830 (Martinique).

? Hæmulon bonariense, CUV. & VAL., v, 1830, 254 (Buénos Ayres).

Hæmulon xanthopteron, CUV. & VAL., v, 1830, 254 (Martinique).

Hæmulon xanthopterum, GÜNTHER, i, 312, 1859 (Martinique; Jamaica; Trinidad; Puerto Cabello).

Hæmulum xanthopterum, COPE, Trans. Am. Philos. Soc., 1871, 471 (St. Croix).

Hæmylum xanthopterum, BEAN, Proc. U. S. Nat. Mus., 1880, 96 (Bermuda; no descr.).

Habitat.—West Indies. Florida Keys and Bermudas to Brazil.

Head, 3 ($3\frac{4}{5}$?); depth, $2\frac{3}{4}$ ($3\frac{4}{7}$). D. XII, 14. A. III, 8. Scales, 6–50–11. Length, 7 inches.

Body, oblong-ovate, comparatively deep and compressed; back somewhat elevated. Anterior profile, nearly straight from the tip of the

snout to the nape, thence gently convex. Snout, rather short, acute; its length 3 in head.

Mouth, not very large; the gape curved; the maxillary reaching about to opposite front of the pupil; its length $2\frac{1}{3}$ in head. Teeth of moderate size, the outer enlarged; antrorse teeth in the posterior part of each jaw considerably enlarged; those of the upper jaw canine-like, larger than any of the other teeth.

Eye large, $3\frac{1}{2}$ in head; interorbital width, $3\frac{1}{2}$; preorbital, low; its least width, $7\frac{1}{2}$ in head. Preopercle rather evenly and shapely serrate.

Scales, large; those of the anterior and middle parts of the body, down to the level of the lower part of pectoral, much enlarged, having nearly double the depth of the scales above lateral line. Rows above lateral line running very obliquely upward and backward; those below somewhat wavy, most of them forming a curve with the convexity downward and backward.

Dorsal spines, moderate; the fourth, 2 in head; upper caudal lobe, $1\frac{2}{3}$. Longest anal rays, $2\frac{1}{3}$ in head, their tips extending when depressed beyond the tip of the last ray. Second anal spine much longer and stronger than third, 2 in head, its tip when depressed reaching nearly to tip of last ray; ventrals, $1\frac{2}{3}$ in head; pectorals, $1\frac{1}{3}$.

Color in life, light bluish-gray as ground color. A bronze-yellow on the upper part of each scale, these forming continuous undulating stripes on the whole body and head, wider than the interspaces of the ground color. On caudal peduncle they are nearly straight; on anterior part of the body below lateral line they are broader and very oblique. A horizontal stripe, crossing the others, runs along the side of back from occiput to last rays of soft dorsal, of the same golden-yellow; yellow around eye; yellow shades and streaks on cheeks, not strongly marked as in *sciurus* and *plumieri;* yellow stripes on top of head; angle of mouth black, inside brick-red. A large black blotch under angle of preopercle; fins bright golden-yellow; the pectoral and spinous dorsal paler. In spirits the ground color becomes grayish and the stripes brownish or dusky.

This species is rather rare at Key West, where it is known as the *French Grunt* or *Open-mouth Grunt.* In Havana, it is more common, and is called *Ronco Condenado.* It reaches a length of nearly a foot. Its peculiar coloration and large lateral scales render it one of the most easily recognizable of the species.

There is no doubt as to the name to be retained for this species, the name *flavolineatus* of Desmarest having clear priority over all the names of species described by Cuvier, the description and figure given by him being very good. In the first description of the genus *Hæmulon*, the *Diabasis flavilineatus* is expressly mentioned, by Cuvier, as one of the species to be referred to the genus.

The synonymy of the species is, however, rather uncertain. *H. heterodon*, Cuv., certainly belongs here, and most probably *H. xanthopteron* also. *H. canna* and *H. bonariense* are so very briefly described as to be prac-

tically unrecognizable, but the account of the coloration suggests this species rather than either *H. continuum* or *H. carbonarium*.

14. Hæmulon chrysargyreum.

Hæmulon chrysargyreum, GÜNTHER, i, 314, 1859 (Trinidad); GÜNTHER, Shore Fishes, Challenger, 7 (Fernando Noronha).

Habitat.—West Indies to Brazil.

We know this species only from the description of Dr. Günther. It is certainly very close to *H. tæniatum* and may prove to be the adult form of that species.

15. Hæmulon tæniatum.

Hæmulon tæniatum, POEY, Memorias, ii, 182, 1860 (Cuba); POEY, Synopsis Piscium Cubens., 319; JORDAN, Proc. U. S. Nat. Mus., 1884, 126 (Key West).
Brachygenys tæniata, POEY, Enumeratio Pisc. Cubens., 1875, 47.

Habitat.—West Indies. Florida Keys; Cuba. Head, $3\frac{1}{5}$ ($4\frac{1}{3}$); depth, $3\frac{2}{7}$ ($4\frac{1}{3}$). D. XII, 14; A. III, 9. Scales, 7–52–13. Length $5\frac{1}{8}$ inches.

Body, more elongate than in any of the other species, except *D. aurolineatum*, moderately compressed, the back little elevated; the profile forming a weak but nearly regular curve from in front of eyes to dorsal; before the eyes is a slight angle and the profile of the snout is rather more steep. Snout very short and obtuse, its length $3\frac{2}{3}$ in head.

Mouth very small for the genus, smaller than in any other species, its gape but little curved; maxillary reaching a little past front of eye, its length, $3\frac{1}{4}$ in head; teeth, weaker than in any other of our species, the posterior teeth scarcely enlarged.

Eye very large, 3 in head; interorbital space broad, convex, its breadth 4 in head; preorbital very low, its least breadth $7\frac{1}{2}$ in head. Preopercle evenly and rather sharply serrate.

Scales small, very regularly arranged, those above lateral line in very oblique series, those below in horizontal series.

Dorsal spines slender and high, the fourth $1\frac{3}{4}$ in head. Upper caudal lobe 1. Longest anal rays 2 in head, their tips not nearly reaching, when produced, to the tips of the last rays. Second anal spine short and weak, $2\frac{3}{4}$ in head, not longer than third, and but little stronger, its tip when depressed reaching to base of the median soft rays and not to the tip of the third spine. Ventrals, $1\frac{3}{5}$ in head; pectorals, $1\frac{3}{5}$. Color in life, bluish above, white below, sides with five stripes of clear bronze orange, four most distinct, all of equal width, about half pupil; a median stripe from middle of interorbital space to dorsal; the next pair from tip of snout above to last rays of dorsal, becoming median on caudal peduncle; one from nostril above eye to below last rays of soft dorsal; one through snout and eye, straight to base of caudal; one below eye to lower part of caudal; a very faint one from angle of mouth and along lower part of sides. Axil slightly dusky. Fins all light orange yellow, unmarked; dorsal and anal with very narrow dusky edge; no trace of dark caudal spot; mouth pale reddish within, in young, light orange in adults. In spirits the body and head are bluish silvery.

This little fish, the smallest of the genus, is abundant both at Key West and Havana. None of the specimens seen exceed 6 inches in length. This species approaches more closely than any other to the genus *Pomadasys*. It is possible it may prove to be the young of *H. chrysargyreum*, in which case the latter name has priority.

16. Hæmulon rimator, nom. sp. nov. *Tom-tate; Redmouth Grunt; Cæsar.*

? *Perca striata*, LINNÆUS, Syst. Nat., ed. x, 1758, 293 (North America); *ibid.*, ed. xii, 1766, 487; GMELIN, Syst. Nat., 1788, 1319 (copied).

Hæmulon chrysopteron, CUVIER & VALENCIENNES, v, 1830, 240 ("brought by Milbert from New York;" erroneously identified with *Perca chrysoptera*, L., which is a *Pomadasys*); DE KAY, New York Fauna, Fishes, 1842, 85, pl. vii, f. 22 (New York market); HOLBROOK, Ichth., S. Car., 121, 1860 (Charleston).

Hæmulon chrysopterum, GÜNTHER, i, 313, 1859. (Jamaica; Trinidad).

Bathystoma chrysopterum, PUTNAM, Bull. Mus. Comp. Zool. 13, 1863 (name only).

Diabasis chrysopterus, JORDAN & GILBERT, Synopsis Fish. N. A., 1883, 553; BEAN, Cat. Fish. Exh., London, 1883, 58 (Pensacola).

Hæmulon quadrilineatum, HOLBROOK, Ichth. S. Car., 1860, 195 (Charleston; not of C. & V.).

Hæmulon ? caudimacula, POEY, Synopsis Pisc. Cubens., 1868, 319 (Cuba; not of C. & V.).

Hæmulon parræ, POEY, Enumeratio Pisc. Cubens., 1875, 47 (not *Diabasis parræ*, DESM.).

Diabasis aurolineatus, JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 276, 307 (Pensacola); *ibid.*, 1882, 602 (Charleston); JORDAN & GILBERT, Syn. Fish. N. A., 973, 1883; BEAN, Cat. Fishes Exh., London, 1883, 58 (Pensacola); JORDAN, Proc. U. S. Nat. Mus., 1884, 126 (Key West). (Not *Hæmulon aurolineatum*, C. & V.)

Hæmulon rimator, (JORDAN & SWAIN, MSS.) BEAN, Proc. U. S. Nat. Mus., 1884, 158 (Jamaica).

Habitat.—West Indies; North Carolina to Trinidad; apparently more abundant on our South Atlantic coast than southward.

Head, $2\frac{5}{7}$ ($3\frac{2}{5}$); depth, $2\frac{5}{6}$ ($3\frac{1}{2}$). D. XIII, 15. A. III, 8. Scales 7–52–13. Length, 8 inches. (In another example, depth 3 in length.)

Body rather elongate but not fusiform, the back somewhat elevated, the profile straight or slightly convex from tip of snout to behind eye where it becomes gradually more convex. Snout short, rather pointed, about 3 in head.

Mouth large, the maxillary reaching middle of pupil, its length 2 in head. Teeth not very strong, those of the outer series a little enlarged; the antrorse posterior teeth rather large.

Eye rather large, $4\frac{1}{4}$ in head; interorbital space convex, $3\frac{3}{4}$ in head; preorbital low, its least breadth 8 in head. Gill-rakers small.

Scales rather small, those above lateral line regularly arranged in oblique series, the series below nearly horizontal.

Dorsal spines slender and high, the fourth 2 to $2\frac{1}{3}$ in head; upper caudal lobe $1\frac{1}{2}$ in head. Longest anal rays 3 in head, their tips not reaching tips of last rays when depressed. Second anal spine but little longer than third, $2\frac{5}{6}$ in head, the two more nearly equal than usual in this genus, their tips when depressed barely reaching middle of last ray. Ventrals, $1\frac{3}{4}$ in head; pectorals, $1\frac{1}{2}$; color in life silvery white,

slightly bluish above, with iridescent reflections. Edges of scales of body light yellow, these forming continuous light yellow lines, those below lateral line horizontal, those above very oblique. Besides these, a narrow continuous streak of light yellow above lateral line, from head to end of soft dorsal, and another from eye to middle of caudal. Head silvery yellowish above; inside of mouth red; no black under preopercle; traces of black blotch at base of caudal. Fins colorless, the lower slightly yellowish. The young are light olivaceous, grayish-silvery below; a dark bronze band, narrower than pupil, darkest in the younger specimen from snout through eye straight to base of caudal; above this, two or three dark streaks, the middle one most distinct, from eye to above gill-opening; another, beginning on top of snout on each side, passing above eye, and extending parallel with the first-mentioned stripe straight to last ray of dorsal, where it meets its fellow of the opposite side; a dark streak from tip of snout along median line to front of dorsal; a large rounded black blotch at base of caudal, some obscure dusky shading below soft dorsal and at base of pectoral; fins all plain, upper slightly dusky; anal nearly white; pectorals, caudal, and ventrals light yellow; lining of opercle plain orange; inside of mouth scarlet. In the large specimen (5¼ inches long) the dark stripes are fainter, paler, and more yellowish; several fainter bands occur between the broader ones, and faint oblique streaks of light bronze follow the rows of scales, those above lateral line oblique. In spirits the adult is plain silvery. This species is very common about Charleston, where it is one of the most abundant food-fishes. About Pensacola and Key West the adult are less numerous, but at the latter place the young swarm everywhere about the wharves and shores. At Key West it is known as "Tom-tate." From its small size (rarely reaching a foot in length) it is held in low esteem, and is not often brought into the market. It was not observed by Professor Jordan at Havana.

The synonymy of this species has been much confused, although most of the confusion has been unnecessary.

This is perhaps the species indicated by Linnæus under the name *Perca striata*. The number (13) of dorsal spines and the comparison with *P. melanura* renders it likely that either this species or *H. quadrilineatum* was intended. There is nothing, however, in the description by which we can ever hope to decide which of the two should retain the name *striatum*. We are therefore not justified in applying it to either.

The following is Linnæus's account:

"striata, 22. P. pinnis dorsalibus unitis, cauda bifida, corpore striato.

$$\text{"D. } \frac{13}{28}\text{. P. 15. V. } \frac{1}{6}\text{. A. } \frac{3}{11}\text{. C. 17.}$$

"*Habitat in* America *septentrionali. Mus. de Geer.*

"*Opercula subserrata. Radius secundus analis validissimus. Cauda nigra non est, qua differt a P. Melanura.*"

The name *chrysopterum* has been generally applied to the present species. This name comes from the *Perca chrysoptera* of Linnæus.

This *Perca chrysoptera* was based on a specimen sent from Charleston by Dr. Garden. This specimen is still preserved in London, and it belongs, according to Dr. Bean, who has examined it, to the species called by Cuvier *Pristipoma fulvomaculatum*. This species should therefore be known as *Pomadasys chrysopterus*. With this *Perca chrysoptera* Linnæus wrongly associates the Margate-fish of Catesby, which is *Hæmulon gibbosum* (*album*). Cuvier has identified both Catesby's fish and the Linnæan *Perca chrysoptera* with the present species, which he calls *Hæmulon chrysopteron*. It is evident from the above that the name *chrysopterum* cannot properly be retained for this or any other species of *Hæmulon*.

The name *aurolineatum* has been applied by Jordan & Gilbert to this species, but erroneously, as is shown beyond. We have, therefore, no alternative but to give to the present species a new name, as none of those names by which it has been called (*chrysopterum*, *aurolineatum*, *caudimacula*, *parræ*) were originally intended for it. We have, therefore, proposed the name *Hæmulon rimator*, in allusion to the inquisitive habits shown by the young of the species. They swarm about the wharves and are a nuisance to the fisherman, nibbling off his bait.

Both *Hæmulon rimator* and *H. plumieri* have been recorded from "New York," but no good evidence exists that either species passes to the northward of Cape Hatteras. None of the others range far north of the Tropic of Cancer.

17. Hæmulon aurolineatum. *Jéniguano.*

Hæmulon aurilineatum, Cuvier & Valenciennes, Hist. Nat. Poiss., 1830, v, 257 (Brazil; San Domingo); Günther, i, 318 (Pernambuco); ? Cope, Trans. Am. Philos. Soc., 1871, 471 (St. Martins; name only).

Hæmulon jéniguano, Poey, Memorias, ii, 183, 1860 (Cuba); Poey, Synopsis, 319: Poey, Enumeratio, 47.

Bathystoma jéniguarno, Putnam, Bull. Mus. Comp. Zoöl., 1863, 12 (name only).

Diabasis jéniguano, Jordan & Gilbert, Synopsis Fish. N. A., 925, 1883 (Garden Key); Bean, Cat. Fish. Exh. London, 1883, 58 (Garden Key).

Habitat.—West Indies; Florida keys to Cuba.

Head, 3 ($3\frac{3}{5}$); depth, $3\frac{3}{7}$ ($4\frac{1}{7}$). D. XIII, 15; A. III, 8. Scales, 8–51–13. Length, 6 to 8 inches.

Body compressed, fusiform, the back not elevated; the profile forming a weak but nearly regular curve from the tip of the snout to the front of the dorsal. Snout short, moderately pointed, 3 in head. Mouth large, curved, the maxillary reaching to slightly beyond middle of pupil, its length $1\frac{5}{6}$ in head. Teeth not very strong, about as in *H. rimator*.

Eye large, $3\frac{3}{4}$ in head; interorbital space convex, its width 4 in head; preorbital very low, its least breadth about 7 in head. Gill-rakers

small, about 12 on lower part of arch. Scales rather small, arranged about as in *Hæmulon rimator*.

Dorsal spines slender, rather high, the fourth $2\frac{1}{3}$ in head. Upper caudal lobe, $1\frac{1}{3}$ in head. Longest anal rays, $2\frac{1}{5}$ in head, their tips not reaching nearly to tips of last rays. Second anal spine not very much longer than third; about 3 in head, reaching when depressed little past the base of the last ray. Ventrals, $1\frac{1}{5}$ in head; pectorals, $1\frac{1}{2}$.

Color in life dusky gray, with seven or eight yellow longitudinal streaks, the one through eye widest; mouth very red; no dusky spot under the angle of preopercle; fins gray; dorsal scarcely yellowish.

In spirits the vertical fins and snout are somewhat dusky; the paired fins are grayish, the golden stripes faint.

This little fish is very abundant at Havana, where it is often brought into the market. It reaches a smaller size than any other of the genus except *H. tæniatum*. It has been taken at Garden Key, Florida, but was not observed at Key West by Professor Jordan. In its relations it is extremely close to *H. rimator*. It is more slender and fusiform in outline, and its coloration is usually of a deeper yellow, otherwise we are unable to point out any differences of importance.

We have adopted the name *aurolineatum* for this species, and not for *H. rimator*, on the strength of the following account of the typical specimen of *Hæmulon aurolineatum* received from Dr. H. E. Sauvage, of the museum at Paris.

"*Hæmulon aurolineatum*, Brazil, Delalande, type.

"Length of the body, 0.220^{m}, height of the body, 0.055^{m}, length of head, .060^{m}. Height of the body contained nearly four times in the total length, and $3\frac{1}{2}$ without the caudal."

As the description of Cuvier & Valenciennes agrees in other respects equally well with either species, the above measurements lerve no doubt of the identity of their type with *H. jéniguano*. *Hæmulon rimator*, young or old, is never so slender as the above measurements would indicate.

18. Hæmulon quadrilineatum. *White Grunt.*

? *Capeuna brasiliensibus*, MARCGRAVE, Hist., &c., Brasil., i, 1648, 155, fig, p. 163.

? *Grammistes trivittatus*, BLOCH & SCHNEIDER, Syst. Ichthyol., 1801, 188 (on the description of Marcgrave).

Diabasis trivittatus, JORDAN & GILBERT, Syn. Fish., N. A., 1883, 554 (erroneously ascribed, after Holbrook, to the Carolina fauna).

? *Serranus capeuna*, LICHTENSTEIN, Abhandl. Berlin Akad., 1821, 288 (on the description of Marcgrave).

? *Hæmulon capeuna*, CUVIER, Règne Animal, 1829 (no description; after Marcgrave).

Hæmylum capeuna, GOODE, Bull. U. S. Nat. Mus., v., 1876, 53, (Bermuda).

Hæmulon quadrilineatum, CUV. & VAL., v., 1830, 238, pl. 120 (San Domingo); GÜNTHER, i, 316, 1859 (copied); POEY, Repertorio, i, 310, 1867; ii, 161; POEY, Synopsis, 1868, 319 (Cuba); POEY, Enumeratio Pisc. Cubens., 1875, 47; COPE, Trans. Am. Philos. Soc., 1871, 471 (St. Croix).

Hæmulon quinquelineatum, POEY, Memorias, ii, 419, 1860 (Cuba).

Habitat.—West Indies; Bermudas to Brazil.

Head, $3\frac{1}{2}$ ($4\frac{1}{2}$); depth, 3_5 ($4\frac{1}{2}$). D. XIII, 13; A. III, 7. Scales, 7–10–18. Length (9839, Cuba), $7\frac{1}{2}$ inches.

Body elongate, fusiform; more slender than in any other of the species; the back little elevated; not much compressed; the anterior profile gently convex; not steep.

Head small, the snout short and not very acute, its length $3\frac{1}{3}$ in head. Mouth comparatively small, smaller than in *H. aurolineatum*, the maxillary extending to beyond front of pupil; its length $2\frac{1}{5}$ in head. Teeth rather small, the outer and posterior a little enlarged. Lower jaw slightly included. Eye large, $3\frac{2}{5}$ in head. Preorbital narrow, its least breadth 9 in head. Interorbital space broad, convex, its width $2\frac{2}{3}$ in head. Preopercle moderately serrate.

Gill-rakers much longer and more numerous than in *H. aurolineatum* and other species, about 18 on lower part of anterior arch, the longest three-fourths least depth of preorbital.

Scales notably smaller than in any other species of the genus, those above lateral line in very oblique series, those below more nearly horizontal, and none of them specially enlarged. Soft fins scaly as usual.

Dorsal spines slender, rather low, the fourth or longest, $2\frac{1}{10}$ in head. Soft dorsal long and low, the longest ray, $3\frac{2}{5}$ in head; caudal deeply forked, the upper lobe, $1\frac{1}{10}$ in head. Anal rather low and small, its longest rays, $3\frac{1}{5}$ in head, not reaching when depressed to the tip of the last rays. Second anal spine notably longer and stronger than third, $2\frac{2}{5}$ in head, reaching when depressed a little past base of last ray; ventrals $1\frac{3}{5}$ in head; pectorals $1\frac{2}{5}$.

Color in spirits pearly-gray, with continuous brown streaks (golden in life), one on the median line above from tip of snout to dorsal; four on each side of top of head above eye; three of these extending on the body, but only the second continuous, this very distinct and reaching last ray of dorsal. Below these, two extending backward from eye, the uppermost distinct anteriorly, fading behind, the lowest fading anteriorly; below this traces of another dusky stripe. There are thus three or four distinct longitudinal streaks on body, with two or three fainter ones. Fins pale, probably yellowish in life.

This is one of the smaller species, probably never exceeding a foot in length. It is allied to *H. aurolineatum* and *H. rimator*, but deviates from the ordinary *Hæmulon* type more than either of these.

We have not seen this species in life, it not having been obtained by Professor Jordan either at Key West or Havana. It has been included in most recent lists of our Atlantic coast species, apparently on the authority of Dr. Holbrook. But Dr. Holbrook's figure of *quadrilineatum* evidently represents a rather slender and brightly-colored individual of *H. rimator*. There remains then no reason why *H. quadrilineatum* should be retained in lists of fishes of the United States.

Poey rejects the earlier names *capeuna* and *trivittatus*, based on the description of Maregrave, because from its imperfection the latter "does not merit to be cited."

Goode has "made use of the specific name *capeuna* because it seems to have priority over that usually accepted. The name *trivittata* can scarcely stand, since it is not only inapplicable but sure to mislead, as is evident from the two other names which have been given the species, viz: *quadrilineatum* and *quinquelineatum*."

But this reason for rejecting *trivittatum* is insufficient. If Maregrave's *capeuna* can be shown to be this species, we must call it *Hæmulon trivittatum*. If Maregrave's fish cannot be identified, the species must stand as *H. quadrilineatum*.

The following is a copy of Maregrave's description, for which we are indebted to the kindness of Professor Poey:

CAPEUNA BRASILIENSIBUS Maregrave (page 155).

Piscis est corpore oblongo non lato, qui in septem digitorum longitudinem excrescit. Os illi obtuse acuminatum; habetque in superiore arque inferiore mandibula unam seriem minimorum denticulorum: tota cavitas oris cum lingua sanguinei coloris insignis. Oculi illi parvi, stuferi magnitudine, crystallini, circulo partim argenteo colore variegato. Pinnas obtinet septem; in quolibet latere post branchiam unam oblongam, tenuem quasi triangularem: duas triangulares in infimo ventre; unam post anum firma spina munitum; unam per dorsi longitudinem excurrentum, cujus anterior medietas spinas munita quam recondere potest, posterior mollis et sine spinis: cauda bicornis, molli pinna. Tegitur squamulis parvis argenteis, inquibus aliquid aurei transplendet. In quolibet latere habet duas lineas crassas aurei coloris, unam a summitate oris per oculos et mediam latus tendentem ad caudam, alteram magis superius per dorsi latum pergentam. In summitate capitis livescit. Pinnæ omnes sunt cinereæ: "venter albus ut et ejus pinnæ. Coctus boni est saporis. Capitur in mari inter scopulos."

This description is accompanied by a rough figure (accidentally interchanged in the text with a figure intended to represent *Hæmulon plumieri*, the *Guaibi Coara Brasiliensibus* of Maregrave). This figure shows an elongate body, the depth less than one-third the length, and a rather large mouth the maxillary about 2¾ in head, but still not reaching the front of the small eye. It must apparently be one of these three species, *quadrilineatum*, *ronco*, *aurolineatum*, but even this is not certain. On the whole, it most resembles *quadrilineatum*, with which it has been usually identified, but there is not much ground for this opinion, and on the whole we must agree with Poey, that it "scarcely merits citation," although it very likely belongs here.

19. Hæmulon flaviguttatum.

Hæmulon flaviguttatus, GILL, Proc. Ac. Nat. Sci., Phila., 1862, 254 (Cape San Lucas).

Hæmulon flaviguttatum, STEINDACHNER, Ichth. Beitr. iii, 14, 1875; Mazatlan; Acapulco; Altata; Panama); STREETS, Bull. U. S., Nat. Mus., vii, 79, 1877 (Lower California).

Diabasis flaviguttatus, JORDAN & GILBERT, Bull. U. S. Fish Comm., 1881, 324; 1882, 107, 110 (Mazatlan, Panama); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 361, 381, 626 (Cape San Lucas, Panama).

Hæmulon margaritiferum, GÜNTHER, Proc. Zool. Soc., 1864, 147; GÜNTHER, Fishes Centr. Amer., 1869, 419, pl. lxv, fig. 2 (Panama).

Habitat.—Pacific coast of tropical America; Cape San Lucas to Panama.

Head, $3\frac{3}{4}$ ($4\frac{2}{3}$); depth, $3\frac{1}{3}$ ($4\frac{1}{8}$). D. XII or XIII, 15. A. III, 9. Scales 5–50–14. Length, (17,543, Gulf of California) 12 inches.

Form different from that of the other species of *Hæmulon*, of an elongate oval, compressed; the back elevated; the snout sharp; the caudal peduncle long and slender; the ventral outline more curved than usual in this group.

Head small and short, with short, pointed snout, which is $3\frac{3}{5}$ in its length; anterior profile slightly concave before eye, thence steep and slightly convex to front of dorsal. Mouth small, quite strongly oblique, the maxillary extending to or slightly beyond front of pupil, its length $2\frac{3}{5}$ in head, lower jaw considerably projecting, teeth all very small, the outer and posterior scarcely enlarged. Eye large, $3\frac{1}{5}$ in head in adult. Interorbital space very broad, $3\frac{3}{5}$ in head. Preorbital very narrow, its least breadth $7\frac{1}{3}$ in head. Preopercle finely and sharply serrate, its angle projecting backward and broadly rounded.

Gill-rakers much longer and more numerous than in any other species of *Hæmulon*, the longest about equal to least breadth of preorbital, about 22 on the lower part of the arch.

Scales of moderate size, those above lateral line arranged in very oblique series, and very slightly enlarged; soft fins, scaly as usual.

Dorsal spines 12 (sometimes 13) in number, low and rather slender, the longest $2\frac{3}{5}$ in head. Soft dorsal, long and low, the longest ray $4\frac{1}{3}$ in head. Caudal widely forked, its upper lobe scarcely shorter than head. Anal fin long and low, the anterior rays not reaching nearly to base of last ray when depressed, their length $3\frac{1}{8}$ in head. Second anal spine 3 in head, little longer or stronger than third. Ventrals, $1\frac{3}{5}$ in head. Pectorals long, $1\frac{1}{1\,5}$.

Color, in spirits, dark steel-gray; a small very distinct pale spot on each scale of back and sides, surrounded by darker. This spot is, in spirits, light yellowish; in life of a pearly blue. Head plain; a small dusky blotch under angle of preopercle. Fins plain (probably yellow in life). Young with a large black blotch at base of caudal, as in *H. steindachneri* and *H. maculicauda* and without the dusky horizontal streaks seen in most of the other species.

This species is generally common along the Pacific coast of tropical America. It has no analogue among the Atlantic species. On account of the peculiarities of the form of the body, the mouth, and the vertical fins, and especially the increased development of the gill-rakers, we may regard it as the type of a distinct subgenus, which we may call *Lythrulon*. Its cranium has not been examined, but it will probably be found to differ somewhat from the usual type in *Hæmulon*.

20. Hæmulon maculicauda.

Orthostœchus maculicauda, GILL, Proc. Ac. Nat. Sci., Phila., 1862, 255 (Cape San Lucas).

Hæmulon maculicauda, STEINDACHNER, Ichth. Beitr., iii, 14, 1875 (Mazatlan; Acapulco).

Diabasis maculicauda, JORDAN & GILBERT, Bull. U. S. Fish Comm., 1881, 325; 1882, 110 (Panama); JORDAN & GILBERT, Proc. U. S. Nat. Mus., 1882, 362, 372, 626 (Cape San Lucas; Panama; Colima).

Hæmulon mazatlanum, STEINDACHNER, Ichth. Notizen, viii, 12, taf., vi, 1869 (Mazatlan).

Habitat.—Pacific coast of tropical America, Cape San Lucas to Panama.

Head, $3\frac{1}{8}$ ($3\frac{4}{5}$); depth, $2\frac{6}{7}$ ($3\frac{1}{2}$). D. XIII (rarely XIV), 15; A. III, 10. Scales, $5\frac{1}{2}$–51–11. Length (29256, Panama), $8\frac{1}{5}$ inches.

Body oblong-elliptical, not much compressed; the back little elevated. Head rather large, moderately pointed anteriorly; the profile nearly straight from the snout to the nape. Snout short, low, rather pointed, its length $3\frac{1}{2}$ in head. Mouth small, a little oblique, the maxillary extending to front of pupil, its length $2\frac{1}{5}$ in head. Lower jaw slightly included. Teeth small, the outer and posterior little enlarged. Preorbital narrow, its least breadth $7\frac{2}{3}$ in head. Eye large; $3\frac{3}{4}$ in head in adult. Interorbital space moderate, convex, $3\frac{4}{5}$ in head. Preopercle moderately serrate. Gill-rakers slightly longer and more numerous than in most other species, about 16 on lower part of arch, the longest about half depth of preorbital.

Scales large, very uniform in size over the body, arranged *above* as well as below lateral line, in longitudinal series, those above lateral line being everywhere parallel with the lateral line. Soft fins, scaly, as usual.

Dorsal spines usually 13, but sometimes 14, in number, rather slender and low, the longest $2\frac{1}{10}$ in head. Soft dorsal low, the longest rays $3\frac{1}{2}$ in head. Caudal moderate, the upper lobe $1\frac{3}{5}$ in head. Anal rather low, the longest rays not reaching, when depressed to middle of last rays, their length about 3 in head. Second anal spine stronger and longer than third, $2\frac{1}{3}$ in head, its tip about reaching base of last ray. Ventrals, $1\frac{3}{4}$ in head; pectorals, $1\frac{1}{5}$.

Color dark brown; each scale of back and sides with a light, pearly gray spot on its middle, these coalescing into continuous light stripes which are sharply defined, one for each row of scales; head plain; fins plain grayish; a large dusky area on base of caudal.

This small species is rather common on the Pacific coast of tropical America. Its peculiar squamation, rendered more noticeable by the corresponding features of coloration, give it an appearance quite distinct in this genus. In other respects it departs less from the usual type than do *H. flaviguttatum* and *H. quadrilineatum*. At present, therefore, we cannot regard *Orthostœchus* as a group of higher than subgeneric value.

List of nominal species of Hæmulon, arranged in chronological order, with identifications.

[Tenable specific names are in italics.]

Nominal species.	Date.	Identifications.
Perca *melanura*, Linnæus	1758	Hæmulon melanurum.
Perca striata, Linnæus	1758	? H. rimator.
Perca gibbosa, Walbaum	1792	H. gibbosum.
Grammistes trivittatus, Bl. & Schn	1801	? H. quadrilineatum.
Calliodon *gibbosus*, Bl. & Schn	1801	H. gibbosum.
Labrus *plumieri*, Lacépède	1802	H. plumieri.
Sparus *sciurus*, Shaw	1803	H. sciurus
Serranus capeuna	1821	? H. quadrilineatum.
Diabasis *parra*, Desmarest	1823	H. parræ,
Diabasis *flavolineatus*	1823	H. flavolineatum.
Hæmulon elegans, Cuvier	1829	H. sciurus.
Hæmulon heterodon, Cuvier	1829	H. flavolineatum.
Hæmulon caudimacula, Cuvier	1829	H. parræ.
Hæmulon schrankii, Agassiz	1829	?? H. steindachnerii.
Hæmulon canna, Agassiz	1829	?? H. *acutum*.
Hæmulon canna, Cuv. & Val	1830	? H. flavolineatum.
Hæmulon bonariense, Cuv. & Val	1830	? Do.
Hæmulon xanthopteron, Cuv. & Val	1830	? Do.
Hæmulon *aurolineatum*, Cuv. & Val	1830	H. aurolineatum.
Hæmulon *quadrilineatum*, Cuv. & Val	1830	H. quadrilineatum.
Hæmulon album, Cuv. & Val	1830	H. gibbosum.
Hæmulon chromis, Brouss	1830	Do.
Hæmulon arcuatum, Cuv. & Val	1830	H. plumieri.
Diabasis obliquatus, Bennett	1835	H. sciurus.
Hæmulon microphthalmum, Günther	1859	H. gibbosum.
Hæmulon *macrostoma*, Günther	1859	H. macrostoma.
Hæmulon *chrysargyreum*, Günther	1859	H. chrysargyreum.
Hæmulon luteum, Poey	1860	H. sciurus.
Hæmulon *carbonarium*, Poey	1860	H. carbonarium.
Hæmulon ararά, Poey	1860	H. plumieri.
Hæmulon multilineatum, Poey	1860	H. sciurus.
Hæmulon dorsale, Poey	1860	H. melanurum.
Hæmulon notatum, Poey	1860	? H. parræ.
Hæmulon *acutum*, Poey	1860	H. acutum.
Hæmulon serratum, Poey	1860	Do.
Hæmulon albidum, Poey	1860	Do.
Hæmulon *tæniatum*, Poey	1860	H. tæniatum.
Hæmulon *jeniguano*, Poey	1860	H. *aurolineatum*.
Hæmulon subarcuatum, Poey	1860	H. plumieri.
Hæmulon quinquelineatum, Poey	1860	H. quadrilineatum.
Hæmulon *scudderii*, Gill	1862	H. scudderi.
Hæmulon *sexfasciatus*, Gill	1862	H. sexfasciatum.
Hæmulon *flaviguttatus*, Gill	1862	H. flaviguttatum.
Orthostœchus *maculicauda*, Gill	1862	H. maculicauda.
Hæmulum margaritiferum, Günther	1864	H. flaviguttatum.
Hæmulon retrocurrens, Poey	1868	H. parræ.
Hæmulon brevirostrum, Günther	1869	H. scudderi.
Hæmulon mazatlanum, Steindachner	1869	H. maculicauda.
Hæmulon maculosum, Peters	1869	H. sexfasciatum.
Hæmulon undecimale, Steindachner	1875	H. scudderi.
Hæmulon continuum, Poey	1875	H. parræ.
Hæmulon *fremebundus*, Goode & Bean	1879	H. fremebundum.
Diabasis *steindachneri*, Jordan & Gilbert	1881	H. steindachneri.
Hæmulon *rimator*, Jordan & Swain	1884	H. rimator.

RECAPITULATION.

We have in this review admitted twenty species of *Hæmulon* as probably valid. We give here a list of the species with an indication of the doubts remaining to be solved in each case. The general distribution of

the species is indicated by the letters W. (Western Atlantic; West Indies, &c.); U (coasts of United States); P. (Eastern Pacific, Mazatlan; Panama, &c.)

Genus HÆMULON, Cuvier.

§ Subgenus *Hæmulon*.

1. *Hæmulon sexfasciatum*, Gill (P.).
2. *Hæmulon macrostoma*, Günther (W.) (Doubtful species, unknown to us: perhaps identical with *H. gibbosum*; possibly with *H. fremebundum*.)
3. *Hæmulon gibbosum*, (Bloch & Schneider), (W. U.). (Possibly more than one species included in synonymy.)
4. *Hæmulon parræ*, Desmarest, (W.). (Possibly more than one species included in synonymy.)
5. *Hæmulon parræ*, (Desmarest) (W. U.). (Possibly more than one species included; possibly should stand as *H. canna*.)
6. *Hæmulon scudderi*, Gill (P.). (Possibly but improbably two species confounded.)
7. *Hæmulon fremebundum*, Goode & Bean, (W. U.). (Possibly has some older name.)
8. *Hæmulon carbonarium*, Poey (W.).
9. *Hæmulon steindachneri*, Jordan & Gilbert, (P. W. ?) (Possibly should stand as *H. schranki*.)
10. *Hæmulon melanurum*, L. (W.).
11. *Hæmulon sciurus*, Shaw (W. U.).
12. *Hæmulon plumieri*, Lacépède (W. U.).
13. *Hæmulon flavolineatum*, (Desmarest) (W. U.). (Some of the synonymy doubtful.)

§ Subgenus *Brachygenys*, Scudder.

14. *Hæmulon chrysargyreum*, Günther (W.). (Species unknown to us.)
15. *Hæmulon tæniatum*, Poey (W. U.). (Possibly young of *chrysargyreum*.)

§ Subgenus *Bathystoma*, Scudder.

16. *Hæmulon rimator*, Jordan & Swain (W. U.). (Possibly should stand as *Hæmulon striatum*.)
17. *Hæmulon aurolineatum*, Cuv. & Val. (W. U.).
18. *Hæmulon quadrilineatum*, Cuv. & Val. (W.). (Should possibly stand as *H. trivittatum*.)

§ Subgenus *Lythrulon*, Jordan & Swain.

19. *Hæmulon flavoguttatum*, Gill (P.).

§ Subgenus *Orthostœchus*, Gill.

20. *Hæmulon maculicauda*, Gill (P.).

INDIANA UNIVERSITY, *August*, 1884.

LIST OF FISHES COLLECTED IN THE VICINITY OF NEW ORLEANS BY DR. R. W. SHUFELDT, U. S. A.

By DAVID S. JORDAN.

In the winter of 1882–'83 a collection of fishes was made in the vicinity of New Orleans by Dr. R. W. Shufeldt for the U. S. National Museum. In the present paper is given a catalogue of the fresh and brackish water species included in this collection. The collection was received at the Museum February 21, 1883.

1. **Scaphirhynchops platyrhynchus**, (Raf.). (No. 32475.)

Dorsal shields 17; lateral 41.

2. **Amia calva**, L. 35243, 35244.

3. **Amiurus natalis**, (Le Sueur). 35209 (5).

Color dark; form robust; spines short; pectoral spine not half head. Head, $3\frac{3}{4}$; depth, $3\frac{3}{4}$; A. 26; in specimen $7\frac{1}{2}$ inches long.

4. **Ictalurus punctatus**, (Raf.). 25219, 25291.

Anal rays, 25–26. Dark spots few in one specimen, obsolete in the other.

5. **Ictalurus furcatus**, (C. & V.). 35218, 32477, 33820.

Anal rays, 34 in each.

6 **Ictiobus ? cyprinella**, (C. & V.). 35221, 35230.

Young specimens.

7. **Ictiobus ? urus**, (Ag.). 35222, 35229.

Young.

8. **Ictiobus ? cyprinus**, (Le Sueur). 35204 (3).

Largest, $6\frac{1}{4}$ inches long. Head, 4 in length; depth, $2\frac{2}{3}$. Longest dorsal ray, $1\frac{1}{4}$ in base of fin. Anterior rays not thick at base. Snout not very obtuse. Angle of mouth below front of eye. D. ii, 24. Scales, 6–37–5.

9. **Erimyzon sucetta**, (Lac.). 35220, 35290, 35292.

Specimens less than 6 inches long, but with three large tubercles on each side of snout before eye. Head, $3\frac{5}{6}$ in length; depth, $3\frac{1}{5}$. D, 11. Scales, 36–13, 37–13, 39–13.

These specimens approach the type of *E. goodei*, to which species they should perhaps be referred. Very likely *E. sucetta* and *E. goodei* may be found to intergrade.

10. **Notemigonus chrysoleucus**, (Mitchill). 35199 (5).

Anal rays, ii, 13. Scales, 48 to 50.

In the genus *Notemigonus*, as already noticed by Dr. S. A. Forbes, the gill-rakers are numerous, slender, and comparatively long. In the allied genus, *Richardsonius*, of the Pacific coast, the gill-rakers are few and very short.

11. Dorosoma cepedianum exile, Jordan & Gilbert. 35195, 35232 to 35239.

The numerous specimens, large and small, seem to be referable to the slight variety *exile*, established by us on Galveston specimens. Examples, 13 inches long, have the depth $2\frac{3}{4}$ to $2\frac{9}{10}$ in length; those 7 inches long, $2\frac{5}{6}$ to 3. The number of anal rays seems to vary considerably, the following numbers being counted on nine specimens: ii, 30; ii, 31; ii, 32; ii, 33; ii, 34 (3); ii, 35 (2).

Scales about 58; scutes 17 + 12. Dorsal rays 1, 12. Dorsal filament about as long as head.

12. Esox vermiculatus, Le Sueur. 35208.

Color very dark; fins somewhat dusky. Sides with about 30 narrow, reticulating cross-streaks; a dark bar below eye. Lips blackish. B. 11–12. D. iii, 13. A. ii, 12. Eye very slightly before middle of head. Head $3\frac{1}{4}$ in length.

13. Fundulus? ocellaris, Jordan & Gilbert. 35226 (6 ♂); 35227 (4 ♀).

Numerous specimens of a species of *Fundulus*, which seems to agree with *Fundulus ocellaris* in all tangible respects, but differs widely in color from the types of that species, as will be seen from the following:

Males with about 15 sharply defined cross-bands, as broad as or broader than the silvery interspaces. A few dark dots on upper parts. Dorsal and anal with pearly dots. Few or none of these on body. Females light olive, with many small dark spots, which form obscure series. Larger spots, as large as pupil, scattered over sides of body. No trace of dark cross-bands. Dorsal with a conspicuous black ocellus on its last rays, as in *F. ocellaris*.

Dorsal fin low and small, inserted a little before the small anal. Oviduct extending around base of first anal ray. D. ca. 10; A. ca. 10. Scales 34–13. Head, $3\frac{3}{5}$ in length; depth, $3\frac{4}{5}$. Interorbital width, $2\frac{1}{10}$ in head. Eye equal to snout, $4\frac{1}{5}$ in head. Largest specimen $2\frac{1}{2}$ inches in length.

In spite of the marked difference in color, I hesitate to regard this as specifically distinct from *Fundulus ocellaris*.

14. Zygonectes chrysotus, (Günther). 32412 (6); 32414 (6); 32420 (4).

? Fundulus cingulatus, Cuv. & Val. ♂ ?.
Zygonectes cingulatus, Jordan & Gilbert. Not *Hydrargyra luciæ*, Baird.

Numerous specimens agreeing well with the description given by us in Proc. U. S. Nat. Mus., 1882, 586, of *Zygonectes cingulatus* and with Dr. Günther's *Haplochilus chrysotus*. It may be the *Fundulus cingulatus* scantily described by Valenciennes, but of this there is no certainty,

and the latter species is said to have 16 cross-bands. *Hydrargyra luciæ* Baird has a dorsal ocellus, and is most likely some other fish.

Head, $3\frac{3}{4}$ to 4 in length; depth, $3\frac{4}{5}$. D. 8 or 9. A. 11. Scales, 33–12. Length of longest specimen, $2\frac{1}{8}$ inches.

Color dusky above, the sides with faint pearly dots, which are most conspicuous in the female. Males with the dorsal and caudal dotted, the latter most so, the dots sometimes arranged in cross-series, sometimes irregularly scattered. Male with about 10 narrow dark cross-bands. Female without bands, the fins entirely plain dusky. No black blotch below eye. No dorsal ocellus in either sex.

15. **Gambusia patruelis**, Baird & Girard. 35196, 32413, 32422.

Many specimens, mostly females, not gravid. I find it extremely difficult to distinguish large females of this species from the typical specimen of *Zygonectes inurus*, with which I have compared them. It is probable that the typical example of the latter species is really a large *Gambusia*.

16. **Mollienesia latipinna**, Le Sueur. 35197; 35210; 35211; 35216; 32415; 32416; 32418; 32421.

(*Mollienesia lineolata*, Girard.)

These specimens do not confirm the validity of the distinctions between *M. latipinna* and *M. lineolata* given by us in Proc. U. S. Nat. Mus., 1882, 259. It is probable that no permanent difference exists.

17. **Anguilla rostrata**, (Le Sueur). 35215 (5).

18. **Elassoma zonatum**, Jordan. 32423 (14).

A specimen about an inch in length. Coloration very dark; eight cross-bands broader than the interspaces; a dusky scapular blotch; a dark blotch below eye. Dorsal, anal, and caudal with narrow, distinct, dark cross-bands; pale parts of body everywhere soiled with dark points.

Head, 3 in length; depth, 3. D. IV, 11; A. III, 5 or 6. Scales, about 36.

18. **Micropterus salmoides**, (Lac.). 35200.

19. **Lepomis cyanellus**, Raf. 35198; 35201.

Numerous specimens, varying considerably in form of body.

20. **Lepomis symmetricus**, Forbes. 35213; 32410; 32419.

Numerous specimens, the largest $3\frac{1}{8}$ inches in length, agreeing closely with Dr. Forbes's original description, and with one of his types (29864).

Head, $2\frac{5}{6}$; depth, $2\frac{1}{10}$. D. X, 9; A. III, 9. Scales, 5–33–13. Mouth much smaller than in *L. cyanellus*, the supplemental maxillary larger; maxillary $2\frac{2}{3}$ in head. Gill-rakers long and slender.

Color in spirits very dark. Soft dorsal mottled with darker, and in 3 specimens provided with a black ocellus; fins all dusky. Small speci-

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mens show faint blue spots on sides of head, and there are traces of about ten irregular dusky cross-bands. Opercular spot large, confined to the bone.

Body formed much as in *L. humilis*.

21. Lepomis miniatus, Jordan. 35214, (2).

This species much resembles the preceding, in spirits, but reaches a larger size. It has much shorter gill-rakers, smaller scales, a different structure of the maxillary, &c.

Scales, 5–40–12.

22. Lepomis pallidus, (Mitchill.) 35212.

23. Chænobryttus gulosus, (Cuv. & Val.). 35203; 35206; 32411: 35231.

Many specimens.

24. Pomoxys sparoides, Lac. 35228.

D. VII, 13. Depth $2\frac{1}{5}$ in length, being, like most specimens from the Gulf States, more elongate than is usually the case with Northern examples of the same species.

25. Haploidomotus grunniens, (Raf.). 35240; 35242.

Head, $3\frac{1}{2}$; depth, 3. D. IX–I, 30; A. II, 7. Lat. l. 52.

26. Gobius würdemanni, Girard. 35202 (23 specimens).

Closely allied to *G. stigmaturus*, *G. boleosoma*, and *G. encæomus*.

Head, $3\frac{2}{5}$ to $3\frac{2}{3}$; depth, $5\frac{1}{4}$. D. VI–12; A. 13. Scales, 32 to 35. Length, of largest specimens about $3\frac{1}{2}$ inches.

Body moderately elongate, subfusiform. Head large, not very blunt; anterior profile gently decurved; snout $3\frac{1}{3}$ to $3\frac{1}{2}$ in head; eye 4; mouth large, slightly oblique, the maxillary reaching anterior border of pupil $2\frac{1}{3}$ in head; teeth small, in moderate bands, slender and curved, the outer above little enlarged, not canine-like; lower jaw slightly included.

Scales moderate, ctenoid rather loosely attached; those on anterior part of body much reduced in size. Head, breast, and a narrow strip before dorsal naked.

Dorsal spines slender, none of them filamentous, the longest nearly $\frac{2}{3}$ head. Soft dorsal and anal low. Caudal pointed, about as long as head. Pectoral, $1\frac{2}{3}$ in head; ventral, $1\frac{1}{5}$.

Color, in spirits, light olive, irregularly shaded with darker and with gray; the pale markings much less conspicuous than in *G. stigmaturus*. About five rounded dark blotches along median line of sides, the number irregular, the posterior one most distinct, forming a spot at base of caudal. A dusky blotch on opercle; two dark streaks below eye; some dusky cross-streaks on top of head. No dark blotch on sides of nape.

Both dorsals and caudal with dark cross streaks. Pectoral faintly cross-barred; two or three small dusky spots on its base.

This species is probably the one named by Girard, *Gobius würdemanni*. Girard's description is, however, so short and so carelessly written as to be of little value for purposes of identification. This description however applies to this species better than to any of its relatives found on the Gulf coast. I have therefore preferred to regard this as the true *würdemanni*, rather than to apply to it a new name.

SMITHSONIAN INSTITUTION, *August* 1, 1884.

LIST OF FISHES COLLECTED IN LAKE JESSUP, AND INDIAN RIVER, FLORIDA, BY MR. R. E. EARLL, WITH DESCRIPTIONS OF TWO NEW SPECIES.

By DAVID S. JORDAN.

In the year 1880 a collection of small fishes was made in Lake Jessup, Florida, a tributary of Saint John's River, and in the Indian River, near Titusville, Fla. Several interesting forms were obtained, among them two which appear to be new to science. The following is a list of the species. L. J. indicates Lake Jessup; I. R., Indian River:

1. **Jordanella floridæ**, Goode & Bean. 25345. I. R.

2. **Cyprinodon variegatus**, Lac. 25313. I. R.

3. **Fundulus similis**, Baird & Girard. 25317. I. R.

4. **Fundulus seminolis**, Girard. 25323. L. J.

D. 17. A. 14. Scales, 54–18.

Coloration rather pale; each scale with a small darker spot, these forming longitudinal stripes, the spots not coalescent. Dorsal with whitish and dusky spots arranged in cross series; caudal with cross series of dark spots. Lower fins plain. A small dusky spot above base of pectoral. Head rather long, narrow, and pointed. Interorbital width equal to length of snout, $2\frac{3}{4}$ in head. Eye, 4 in head. Teeth in a broad band, the outer little enlarged.

This is a large, sleek-looking species, very distinct from all the others in the genus.

5. **Fundulus heteroclitus**, (L.). 25310. I. R.

6. **Zygonectes henshalli**, Jordan. 25330. I. R.

7. **Zygonectes chrysotus**, Günther. 35299. I. R.

8. **Gambusia patruelis**, (B. & G.). 25327; 25333; 25344. I. R.

A multitude of specimens of various sizes. Some have the black blotch below the eye very distinct; in others it is obscure, or altogether obsolete. Some of the largest and deepest colored females correspond exactly to the type of *Zygonectes inurus*. Others match almost perfectly

the description of *Gambusia arlingtonia*. The largest are about 2¼ inches in length.

9. Mollienesia latipinna, Le Sueur. 25312; 25337. I. R.

10. Heterandria ommata, species nova. 25331 (2). I. R.

Two female specimens in poor condition, each about an inch in length.

Head, 3½ in length; depth, 4. D. 6; A. 10. Scales, about 28. Mouth very small, the teeth imperceptible. Eye large. Anal larger than dorsal (not modified in either specimen), inserted immediately below the last rays of the latter.

Color olivaceous; fins a little dusky. A large jet black ocellus at upper part of base of caudal and a smaller one above front of anal. A faint dusky shade along sides and one along median line of back.

This species differs strikingly in coloration from its congener, *Heterandria* (=*Girardinus*) *formosa*, which is also found in the waters of Florida.

11. Querimana gyrans, Jordan & Gilbert. 25315. I. R.

Numerous specimens, somewhat larger than the original types.

12. Menidia menidia, (L.). 25322. L. J.

13. Menidia peninsulæ, (Goode & Bean). 25318. L. J.

14. Elassoma evergladei, species nova. 25326 (8). L. J.; 25334. I. R.

Head, 3$\frac{1}{10}$; depth, 3½. D. IV, 9 or 10; A. III, 5. Scales, 28–13 or 14. Length of largest 1⅓ inches.

Body more elongate and less compressed than in *Elassoma zonatum;* the head thick, moderately pointed anteriorly, flattish, and moderately wide above.

Mouth oblique, very small, its outline curved, upper jaw very protractile; lower jaw projecting. Snout very short, not longer than pupil; preorbital very narrow. Eye, 3 in head. Maxillary of moderate width, barely reaching the vertical from front of eye, its length 4 in head. Teeth in narrow bands, those of the outer series enlarged, close-set, slender, and curved. Apparently a few teeth on the vomer. Cheeks and opercles scaly, the former with 3 or 4 rows of scales. Preopercle entire; opercle unarmed, emarginate behind. Gill-membranes broadly connected across the isthmus. Breast with small scales. Scales of body very large, cycloid. No trace of lateral line. Gill-rakers very small, tubercular. Pseudobranchiæ very small, apparently covered by skin, as in the *Centrarchidæ*.

Vent normal in position. Dorsal fin low, the first spine short, the others graduated; ventral fins very slender and narrow, their filamentous tips nearly reaching front of anal; their rays i, 5; inner ray short, so that the number appears on a hasty examination to be i, 4. Pectoral, 1⅘ in length of head; caudal slightly emarginate, 1½ in head.

Color, in spirits, dusky olive, without cross-bands or scapular spot; centers of scales paler, thus forming faint longitudinal streaks; many scales of back and sides, each with a dark brown spot; these irregularly scattered. Body and head soiled with dark points. Dorsal, anal and caudal conspicuously marked with cross-bars formed of dark dots; ventrals and anal largely dusky, similarly but more faintly barred.

The discovery of a second species of this remarkable genus is very interesting.

15. **Pœcilichthys barratti**, (Holbrook). 25343. I. R.

16. **Lepidogobius gulosus**, (Girard). 25335. I. R.

Largest specimen 3½ inches long. These are larger than the specimens described by us (Proc. U. S. Nat. Mus., 1882, 294), from Pensacola. They are duller in color than the latter. The largest ones have the maxillary extending far beyond the eye, its length 1⅗ in head, and the dorsal spines filamentous, reaching middle of soft dorsal. The smaller ones have the dorsal spines low and the mouth much smaller.

17. **Gobiosoma bosci**, Lac. 25314. I. R.

SMITHSONIAN INSTITUTION, *August* 5, 1884.

CONCERNING SOME OF THE FORMS ASSUMED BY THE PATELLA IN BIRDS.

By DR. R. W. SHUFELDT, U. S. A.

Vicq-d'Azyr saw in the patella a detached olecranon—the homotype of the extensive process, so named—which is found at the proximal extremity of the ulna in the human subject, as it is in many other vertebrates. But what would this time-honored anatomist have to say for himself were he now standing at my side, and his opinion asked as to the nature of the bones of the limb which I have in my hand? It is the complete skeleton of the right lower extremity of *Centrocercus*, taken from a bird of this species less than half grown. Several years ago I figured these very bones, and they may be seen in my Osteology of the Tetraonidæ, plate ix, figure 67. In this limb neither the patella nor the calcaneal sesamoid has yet ossified, owing to the fact that the bird from which it was taken had not sufficiently advanced in age for this condition to have come about. In the memoir in question a large epiphysis was described as occupying the site of the future cnemial crest of the tibia, which part of the bone never becomes a very prominent feature in this bird even after it has become full grown. There seems to be no particular necessity for this accretion to ossify thus separately from the end of the tibia, yet it is found to be quite formidable in size, and as the fowl grows cartilaginous ridges that eventually become the pro- and ectocnemial processes of the tibia are seen upon its anterior face. In

mature birds its amalgamation with the leg-bone is complete, and not a trace of its original existence remains. As it seems to be superadded to the center which forms for the end of the shaft—an ossification found pretty generally among all vertebrates with well-developed limbs—I take it to be the homotype of the olecranon, and believe that Vicq-d'Azyr and his adherents on the patella question could soon be led to a similar conviction. This would be the more likely, as this old-time anatomist, to whom we have referred it, would quickly discover that we largely sided with him in a matter that still furnishes food for argument in present times. I refer to the mooted point of the antitypes of the bones of the extremities. Much has been written upon this subject; it has been well treated by Wyman in his paper "On the Symmetry and Homology in Limbs" published in 1867. Three years later Prof. Elliott Coues ably handled the question of "Antero-posterior symmetry, &c.," in a series of articles which appeared in the New York Medical Record in 1870. Here I think the difference between what is meant by homotypy, or serial homology, and antitypy is most satisfactorily explained. Entirely opposite views in the premises are entertained by Huxley and Flower, while those anatomists nearly agreeing with the last-named were defended by Owen, thirty-four years ago, in his work "On the Nature of Limbs." The scope of this paper will not allow me more than a simple expression of opinion, and this is to the effect that I take the tibia to be the antitype of the ulna, as the fibula is of the radius. There is no doubt about femur and humerus. It is almost unnecessary to add, after what has been said above, that I regard the patella as a sesamoid, and see the homotype of the olecranon in the tuberosity of the tibia of the posterior extremity.

Now, the patella in birds offers us some very interesting and varied forms, notwithstanding the fact that anatomists often complain of the lack of striking differences in the skeletons of this class. No doubt there is much truth in all this, still we find marked departures from a common type, when we come to group and exhibit together characters from widely separated forms.

Quite recently I had the pleasure of examining the leg-bones and patella of the type specimen of *Aptenodytes pennantii* used by Coues in his paper on "Material for a Monograph of the Spheniscidæ." (Proc. Acad. Nat. Sci. Phila., xxiv, 1872.) I give you a life-size drawing of these bones from the right limb of this Penguin, showing the great quadrate patella slightly raised above its articulation with the tibia. In the same cut, A and B, are copies of different views of the patella of *Eudyptes chrysocome*, by Morrison Watson (Report on the *Spheniscidæ;* Rep. Scien. Results of Exp. Voyage of H. M. S. Challenger, Vol. vii, Pl. vii, Figs. 9 and 10, Zoology, 1883). In the magnificent work I refer to, Watson tells us that "the patella is of exceptionally large size, and presents a somewhat peculiar form in the Penguins. In form it

resembles a wedge, the anterior or sharp margin of which is directed forwards, the base backwards towards the femur. The base of the wedge is broad, deeply concave, and adapted to the pulley-like surface of the lower end of the femur. The outer surface of the bone is for the most part smooth, but presents about its middle a deep and narrow groove, which, commencing in front at the middle of the anterior border of the bone, passes obliquely backwards, downwards, and outwards across the external surface. This groove accommodates the tendon of the "ambiens" muscle. The inner surface of the bone is smooth. The upper end of the patella is obliquely truncated, and affords insertion to the muscular fibers of the extensor cruris muscle, while the lower end, narrower and more irregular in form, is attached by means of very short ligamentous fibers to the anterior border of the upper end of the tibia. The patella presents essentially the same characters in every species." This description answers very well for *Aptenodytes*, only this latter Penguin has the patella much larger, as will be seen in the figure. In the great majority of birds where a patella exists it is found to have the form of an oblate hemispheroid, with its base directed upwards for insertion of the extensor cruris. A very good example of this is seen in our common eastern crow (Fig. 2), and it is this bird I have chosen to illustrate this style of patella in the figure (C). We find it associated in the cut with two other rather extraordinary patellæ, that of *Mergus serrator* (D), and *Sula bassana* (E). The bone in the double patella of *Mergus* is of a very elementary character, indeed almost cartilaginous in appearance and consistence. This bird, we see, approaches very near not having any patella at all. The best example I have of this condition is seen in two specimens of *Hæmatopus niger* from the collections at the Smithsonian Institution. Here, in these birds, I fail to find the slightest trace of this sesamoid.

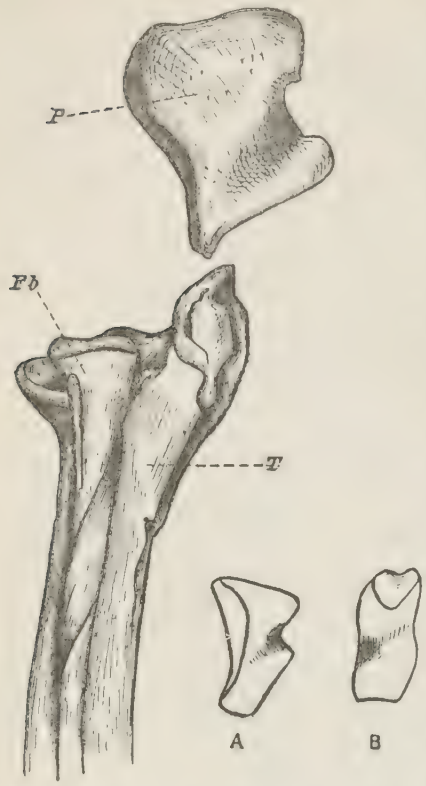


FIG. 1.—Leg-bones and patella, right limb, of *Aptenodytes pennantii*; life-size from nature. T, tibia; F, fibula; P, patella; the last slightly raised above its articulation with tibia. (No. 11976, Smithsonian Collection.) By the author. A, patella of *Eudyptes chrysocome* (from Triston d'Acuha) outer surface, natural size. B, the same seen from in front (after Watson).

Professor Marsh tells us that the patella of *Sula* is perforated by a large foramen for the passage of the tendon of the ambiens muscle, agreeing in this respect with the fossil bird *Hesperornis* (Ordontorni-

thes, page 93). I fail to find any such foramen in the patella of the specimen of *Sula* before me, although it has a shallow, oblique groove across its anterior face that seems to correspond with the one described when speaking of the patella of the Penguin. One of the most interesting and at the same time one of the most familiar to us is the arrangement of these bones in some of the divers. To illustrate the condition of things as they are in these birds, I have chosen and drawn the

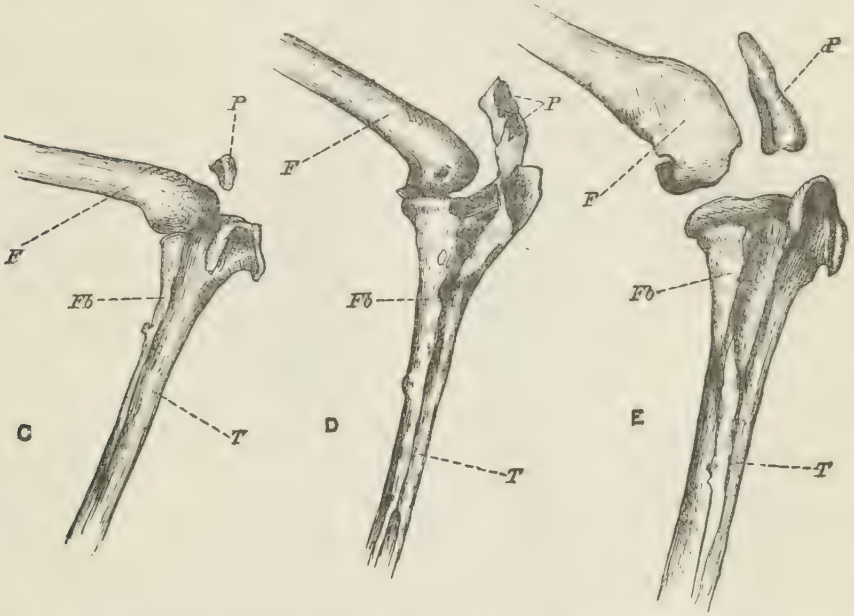


FIG. 2.—C. Femur and leg-bones of *Corvus americanus* showing the patella slightly in advance of its normal position. (No. 133, Collection in Army Medical Museum.) D. The same bones from *Mergus serrator*, showing the two elementary patellæ surrounded by ligament and about in their normal position. (No. 16626, Smithsonian Collection.) E. Same bones from *Sula bassana*, with femur and patella thrown somewhat out of their normal position. (No. 16643, Smithsonian Collection.) All the figures are life-size, chosen from the right limb, and F signifies femur; T, tibia; Fb, fibula, and P, patella throughout. Drawings by the author.

bones of the leg in *Pordieps cornutum* (Fig. 3), giving two different views. Probably no better example exists in all nature showing the coexistence of a patella with a prolonged cnemial crest of the tibia than we fine in *Podiceps*. When in position it is closely applied by its anterior surface to the posterior surface of the greatly produced rotular process already alluded to, extending somewhat above it, which extension in some specimens is bent slightly forward.

This strongly suggests the idea that the olecranon of the ulna can in noways be considered as being homologous with the patella, but only with the rotular process of the tibia; indeed, in each case I must agree with Coues in this matter, and regard these processes as mere extensions of the shaft of the bones in question. (The Medical Record, 1870, p. 194.) In the case of *Colymbus* a positive requirement is met, and that is to afford additional surface for the insertion of the extensores cruris, as well as affording greater leverage in the play of the limb.

The relative proportions of these structures, however, differ very much in *Podiceps* and *Colymbus*. The patella in *Podiceps* probably contains actually more bone, that is to say, it is larger than the rotular process of the tibia; whereas in *Colymbus*, the rotular process of the

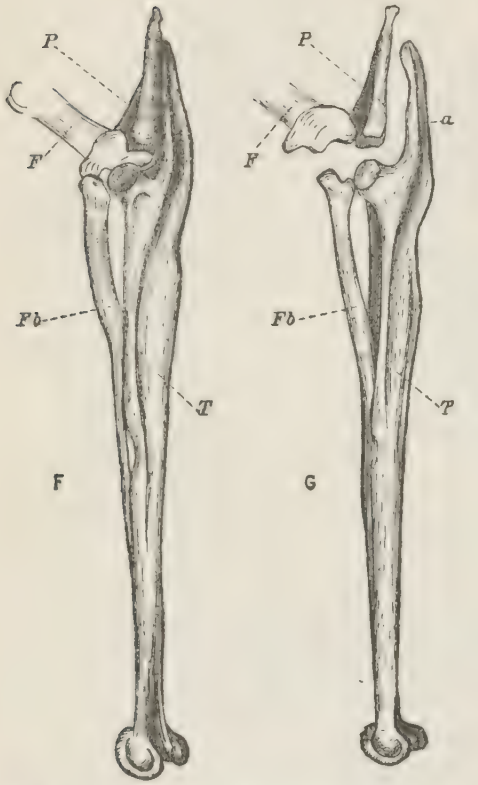


FIG. 3.—Leg-bones and patella from *Podiceps cornutum*. F, the limb rotated slightly outwards. G, a square lateral view. In the first the bones are *in situ*; in the second, femur and patella thrown backwards out of position. Lettering as before, with *a* rotular crest of tibia. No. 1120, Army Med. Mus., life size. Drawn by the author from the specimen.

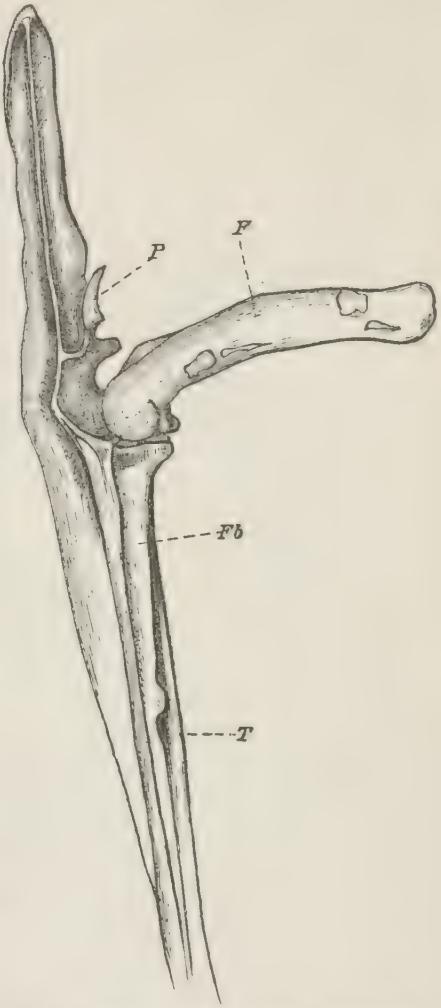


FIG. 4.—*Colymbus septentrionalis*; life size; lettering as in former figures. (Spec. 16628 Smithsonian collection.) By the author.

tibia is a very extensive prolongation upwards of the shaft, while the patella is reduced to a diminutive flake of bone, articulating above the base on its posterior aspect. This is well shown in my drawing of these parts, taken from a specimen of *Colymbus septentrionalis* (Fig. 4).

The Loon, as another representative of the same genus, shows a like condition or arrangement of the structures involved, and we are all familiar with the illustration, now so long on duty, given us by Professor Owen in the second volume of his Anatomy and Physiology of Vertebrates. In passing it may be as well to call attention to the fact,

already noted by the author just referred to, that the great pro- and ecto-cnemial ridges we observe on the anterior aspect of the rotular crest, and continued down the shaft of the tibia, may be present and highly developed without an extension of that crest above the proximal surface of the bone. A beautiful example of this I quite recently saw upon an exceptionally fine specimen of the fossil *Cnemiornis*, received a few weeks ago at the Smithsonian Institution. A bird that affords another very interesting condition of these parts, having a very small patella and a large procnemial process, though differing very much from

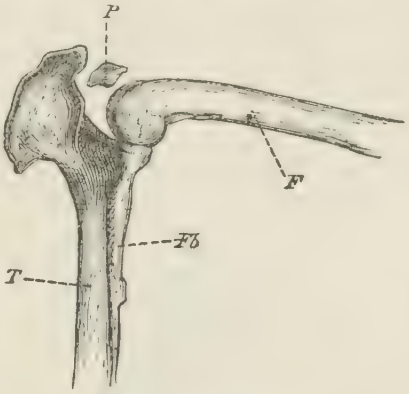


FIG. 5.—*Fulmarus rodgersii*, nat. size; lettering the same. (No. 12612 Smithsonian collection). Showing the patella P in its normal position in this bird. By the author.

Colymbus, is *Fulmarus rodgersii*, a good skeleton of which I find in the collection brought from Alaska by Mr. H. W. Elliott. After what has been written, no special description will be necessary of the drawing here presented, showing these bones in Rogers' Fulmar. Some of the great

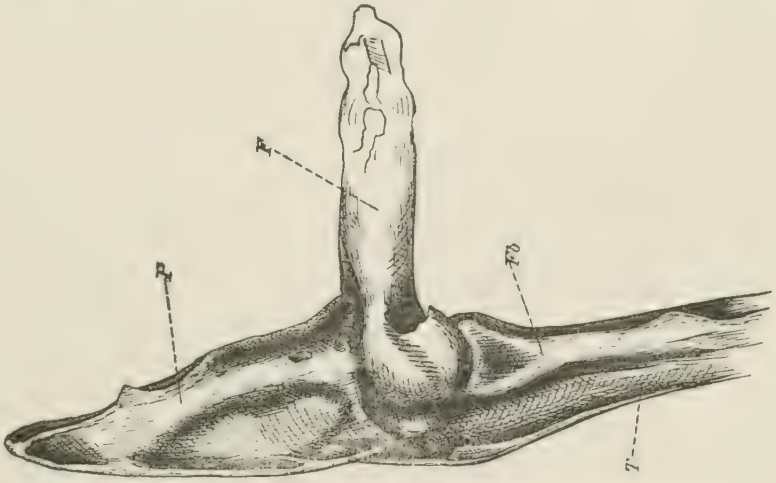


FIG. 6.—*Hesperornis regalis*. ½ nat. size. Letters as before. (After Marsh.)

extinct divers found in the Cretaceous beds of this country had a very big patella. For example, we find "the patella in *Hesperornis regalis* is a large bone, and entirely distinct from the tibia. In its general propor-

tions it resembles the patella in *Podiceps*. It differs materially, however, in being perforated by a large foramen for the tendon of the *ambiens* muscle, agreeing in this respect with the patella of the Gannet (*Sula bassana*, Briss.). The patella is much compressed transversely. Seen from side to side it is triangular in outline, and the outer surface is concave. When in position, its longer axis was nearly parallel with the axis of the tibia. Its lower extremity bears a large twisted articular face for the union with the femur, and the lower posterior half of the inner side is toughened for attachment to the cnemial spine. The position of the patella in the skeleton is shown in Plate XX. When at rest, it extended in front of the anterior margin of the ilium, and, by its muscular attachments, added greatly to the power of the posterior limbs in swimming. The superior extremity is obtusely pointed, and the outer margin is arcuate." (Marsh, Odontornithes, p. 93.)

In No. 41 of Science, I presented a lateral view of the leg-bones of a Cormorant (*Phalacrocorax*), showing the form of the patella in these

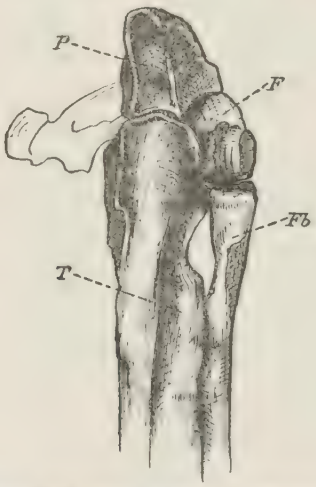


FIG. 7.—*Phalacrocorax bicristatus*, seen from in front. Life size. Letters signify the same as in the other illustrations. By the author.

birds. The same specimen is given here: only an anterior view is chosen instead of the lateral one.

This form is a particularly interesting one, and I am not aware of any bird at present that can show a similar condition of the parts in question.

On the face of it, it almost looks as if a patella had developed of a size equal to the rotular process, and subsequently the two became thoroughly united, and formed one large patella, articulating as shown in the drawings I have made of it. I do not say that this is actually the case, nor were the young of this specimen, which also belong to the collections at the Smithsonian Institution, of a proper age to determine exactly the manner in which this great bulky patella was developed.

Some of the problems that are presented in the evolution of this sesamoid no doubt will be found to be very interesting and instructive.

Now, why is it that in three such forms as *Podiceps*, *Colymbus*, and *Hesperornis*, all undoubtedly powerful divers, in the first we should have retained a patella fully as large as the extensive rotular process; that in the second it has been reduced to a mere flake of bone and an immense rotular process retained; and finally, in their ancient ancestor we again find an enormously developed patella with a very considerable process on the tibia?

Such questions will probably only be arrived at, if they are ever answered at all, by the most searching investigations into the anatomy, and more particularly the physiology, in such instances as these, of living birds. Palæontology in such matters simply offers us the nuts to crack, as of course every vestige of the muscular system has disappeared in our fossil birds.

OBSERVATIONS UPON A COLLECTION OF INSECTS MADE IN THE VICINITY OF NEW ORLEANS, LOUISIANA, DURING THE YEARS 1882 AND 1883.

By DR. R. W. SHUFELDT, U. S. A.

While stationed in New Orleans during the autumn of 1882 and spring and the greater part of the summer of the ensuing year, all the time that could possibly be spared from other duties I devoted to making a collection of the vertebrates and invertebrates of the region. This collection when brought all together consisted of some 2,500 to 3,000 specimens; circumstances existed, however, that prevented me from bestowing the attention upon it that it deserved, or systematically disposing of the material so hurriedly brought together.

The major part of the insects that were taken were sent unassorted in alcohol to the Agricultural Department of Washington. They numbered some five or six hundred, and were collected during the times specified over a limited tract of country lying south of, and just beyond, the city limits.

Through the kindness of Prof. C. V. Riley, I am enabled to present a tolerably complete list of these insects. All of the diagnoses were made under the direction of this gentleman, and I am further under great obligations to him for the interest he has taken in the matter, and other assistance so cheerfully given in connection with the collection.

The first installment was forwarded on the 27th of November, 1882, the specimens in it having been captured between the middle of the preceding month and that time.

On the 5th of December I received from Professor Riley the following determinations of this part of the collection:

I. Coleoptera.

Laxandrus rectangulus Lec. 1 specimen.
Diplochila laticollis Lec. 1 specimen.

Dinentes carolinus Lec. 28 specimens.
Pinophilus parcus Lec. 1 specimen.
Passalus cornutus Fabr. 6 specimens.
Dicerca obscura Fabr. 1 specimen.
Ptychodes vittatus Say. 2 specimens.
Opatrimus notus Say. 1 specimen.

II. Hymenoptera.

Polistes sp.? 1 specimen.
Polistes sp.? 1 specimen.
Monobia quadridens Linn. 1 specimen.
Ichneumon insolens Cress. 1 specimen.

III. Lepidoptera.

Heliothis armigera? Linn. 1 specimen.
Euchætes collaris Fitch. 2 specimens.

IV. Hemiptera.

Proxys punctulatus Beard. 1 specimen.
Largus succinctus Linn. 1 specimen.
Prionotus cristatus Linn. 1 specimen.
Stenopoda culiciformis Stal. 1 specimen.
Zaitha fluminea Say (??). 1 specimen.

V. Orthoptera.

Nemobius vittatus (?). 1 specimen.
Gryllus sp. (larvæ). 2 specimens.
Gryllus sp. (larvæ.) 2 specimens.
Gryllotalpa sp. 1 specimen.
Conocephalus crepitans. 1 specimen.
Xiphidium. 6 specimens. No. 29.
Xiphidium (larvæ). 2 specimens.
Stenobothrus maculipennis. 2 specimens.
Leptysma marginicolli Serv. 3 specimens.
Pyrgomorpha punctipennis Thos. 2 specimens.
Tragocephala vividifasciata. 15 specimens.
Acridium obscurum Serv. 2 specimens.
Tettyx sp. 1 specimen.
Telligidea lateralis. 1 specimen.
Amblytropidia subhyalina Scudd. 1 specimen.
Periplaneta (?). 2 specimens.
Forficula sp. 4 specimens.

VI. Arachnidæ.

Tetragnatha marginata Keys.
Epeira Hentzii Keys.
Epeira septima.
Nephila plumipes.
Miranda bombycinaria.
Zilla hortorum.
Theridium vulgare.
Pholcus atlanticus.
Tegenaria medicinalis.
Filistata capitata.
Dolomedes sexpunctatus.
Lycosa scutulata.
Lycosa venustula.
Tarantula riparia.

From November, 1882, to the latter part of February, 1883, the following additional forms were added to the above list. Several other spiders were also taken, but at the present writing these have not yet been determined.

I. Lepidoptera.

Saturnia io Tab. 3 larvæ.
Acronycta ablinita Sur. & Abb. 1 larva.
Ecpantheria scribonia Stoll. 1 larva.

II. Coleoptera.

Passalus cornutus Fabr. 3 specimens.
Harpalus pennsylvanicus De G. 1 specimen.
Chalepus trachypygus Barm. 2 specimens.
Tropisternus nimbatus Say. 2 specimens.
Chilocorus bivulnerus Muls. 1 specimen.

III. Orthoptera.

Nemobius vittatus? sp. 1 specimen.
Gryllus sp. 1 specimen (larva).
Blatta (?) sp. 1 specimen (larva).

Unfortunately, during the most important part of the year, the spring of 1883, other matters engaged my attention, which made an unnecessary and unsatisfactory drain upon my time. During the greater part of the month of May I was obliged to be absent in New York City, and lost in consequence all those observations so interesting and important to the zoologist and entomologist at this season. From June to August of this summer, however, my collecting was resumed, and the following insects were added to my previous collections. This list completes all that I was enabled to do in this direction up to the present writing. Several forms and odd lots still remain in the hands of the Museum, which have not as yet been fully determined. If any new species remain to be described among these, such descriptions will now have to be postponed until some future time. Should the remaining material upon examination develop facts of sufficient interest, they will be embodied in a short report to supplement the above lists, and the following diagnoses, which were made up to August 7, 1883.

COLEOPTERA.

Orig. No.	
81.	*Tetracha carolina.*
89.	*Tetracha virginica.*
110.	*Tetracha virginica.*
77.	*Tetracha carolina.*
59.	*Plectrodera scalator.*
60.	*Plectrodera scalator.*
90.	*Plectrodera scalator.*
49.	*Plectrodera scalator.*
72.	*Dynastes tityus.*
104.	*Dynastes tityus.*
78.	*Alaus oculatus.*
105.	*Alaus oculatus.*
106.	*Alaus oculatus.*
14.	*Strategus julianus.*
91.	*Strategus julianus.*
79.	*Mallodon dasystomus.*
76.	*Phanæus carmifex.*
38.	*Euphoria melancholica.*
61.	*Euphoria melancholica.*
137.	*Euphoria melancholica.*
82.	*Scarites subterraneus.*
138.	*Scarites subterraneus.*
32.	*Monocrepidius lividus.*
27.	*Harpalus pennsylvanicus.*
107.	*Ptychodes vittatus.*
133.	*Acanthoderes quadrigibbus.*
100.	*Cybister olivieri.*
138.	*Epicanta lemniscata.*
138.	*Cyclocephala immaculata.*
109.	*Ligyrus rugiceps.*
——	*Chalepush trachypygus.*
134.	*Onthopagus hecate.*
40.	*Anisotarsus maculicornis.*
141.	*Goes pulchar.*
97.	*Strategus julianus.*
92.	*Mallodon dasystomus.*
138.	*Cyclocaphala immaculata.*
155.	*Tropistenuas nimbatus.*

February and March, 1883:

——	*Chlænius nemorætis.*
——	*Poecilus chalcites.*
——	*Platynus decorus.*
——	*Aspidoglossa subangulata.*
——	*Anisodactylus harpaloides.*
——	*Saprinus assimilis.*
——	*Sphenophorus placidus.*

March 1–20, 1883:

——	*Copris carolina.*
——	*Dicaelus splendidus.*
——	*Chlænius erythropus.*
——	*Chlænius rufipes.*
——	*Pterostichus acutangulus.*
——	*Amara impuncticollis.*
——	*Chauliognathus marginatus.*
——	*Nyctobates pennsylvanica.*

June 20, 1883:

——	*Cycloneda sanguinea.*
——	*Aphodius stercorosus.*
——	*Chauliognathus marginatus.*
——	*Onthophagus pennsylvanicus.*
——	*Ischyrus quadripunctatus.*
——	*Stenolophus ochropezus.*
——	*Disonycha pennsylvanica.*
——	*Heterocerus collaris.*
——	*Hylesinus aculeatus.*

July 18, 1883:

——	*Onthophagus hecate.*
——	*Platynus punctiformis.*
——	*Brachinus* sp.
——	*Neoclytus erythrocephalus.*
——	*Eupsalis minuta.*
——	*Philhydrus ochraceus.*
——	*Callida punctata.*
——	*Buprestis rufipes.*
——	*Lebia analis.*
——	*Orthostethus infuscatus.*
——	*Rhyssomatus lineaticollis.*
——	*Œme rigida.*

July and August, 1883:

——	*Phileurus truncatus.*
——	*Calosoma scrutator.*
——	*Creophilus villosus.*

Orig. No.

—— *Allorhina nitida.*
—— *Photuris pennsylvanica* (date lost).
—— *Diabrotica duodecimpunctata.*
—— *Loxandrus rectus.*
—— *Platynus mæreus* (?).
—— *Pinophilus latipes.*
—— *Cryptobium latebricola.*

LEPIDOPTERA.

54. *Danais archippus.*
52. *Actias luna.*
55. *Hyperchiria io.*
53. *Samia cecropia.*
51. *Philampelus vitis.*
139. *Chrerocampa tersa.*
140. *Eudamus proteus.*
47. *Psychomorpha epimerus.*

HYMENOPTERA.

85. *Xyocopa virginica.*
93. *Pelopæus cementarius.*
35. *Pelopæus cementarius.*
136. *Pelopæus cementarius.*
135. *Pompilus ferrugineus.*
64. *Pompilus ferrugineus.*
88. *Polistes bellicosus.*
112. *Sphex tibialis?*
115. *Polistes* sp.
113. *Monobia quadridens.*
129. *Melissodes* sp.
116. *Pelopæus cæruleus.*
111. *Polistes annularis.*
128. *Apis mellifica.*
114. *Scolia nobilitata.*
125. *Cerceris bicornuta.*
44. *Camponotus pennsylvanicus.*
46. *Camponotus melleus.*
—— *Scolia nobilitata.*
—— *Pompilus americanus.*
—— *Polistes americanus.*
—— *Polistes* sp.
—— *Labena grallator.*
—— *Mutilla castor.*
—— *Bombus pennsylvanicus.*
—— *Xylocopa virginica.*
—— *Mutilla occidentalis.*
—— *Sphex ichneumonea.*
—— *Pompilus ferrugineus.*
—— *Polistes metricus.*
—— *Polistes bellicosa.*
—— *Stizus grandis.*

ORTHOPTERA.

67. *Gryllotalpa borealis.*
99. *Gryllotalpa borealis.*
29. *Xiphidium* sp.
19. *Amblycorypha oblongifolia.*
96. *Conocephalus ensiger?*
138. *Conocephalus ensiger* (larva).
123. *Tragocephala viridifasciata.*
—— *Calopterus bivittatus* (1 pupa).
—— *Calopterus femur-rubrum.*
131. *Mesops chlorizans.*
123. *Stenobothrus maculipennis* sp.
24. *Calopterus floridanus* Thos. sp.
83. *Tettigidea lateralis.*
20. *Acridium americanum.*
95. *Acridium americanum.*
65. *Periplaneta americana.*
138. *Periplaneta americana* (larva).
—— *Orchelimum glaberrimum.*

July, 1883:

—— *Œcanthus latipennis.*
24. *Paroxya floridana.*
—— *Platyphyllum concavum.*
—— *Romalea microptera.*

DIPTERA.

Orig. No.
31. *Tabanus atratus.*
37. *Tabanus abdominalis.*
—— *Tabanus ruficornis.*
130. *Tabanus* sp.
—— *Tabanus* sp.
22. *Erax striola.*
132. *Stratiomys* sp.
—— *Erax striola* Lw.
—— *Anthrax* sp.
—— *Chrysops* sp.
—— *Lucilia cæsar.*

HEMIPTERA.

75. *Proxys punctulatus.*
138. *Proxys punctulatus.*
98. *Cicada pruina.*
103. *Cicada pruina* (pupa).
102. *Cicada pruina.*
68. *Cicada pruina.*
126. *Stonopoda cinerea.*
—— *Perthostoma aurantiaca.*
—— *Aulacizes irroratus.*

NEUROPTERA.

62. *Agrion* sp.
138. *Agrion* sp.
—— *Mesothemus longipennis.*
—— *Anax heros.*
—— *Anax* sp.
—— *Libellula*, 2 spp.
—— *Agrion*, 2 spp.

MYRIOPODA.

70. *Cermatia forceps.*

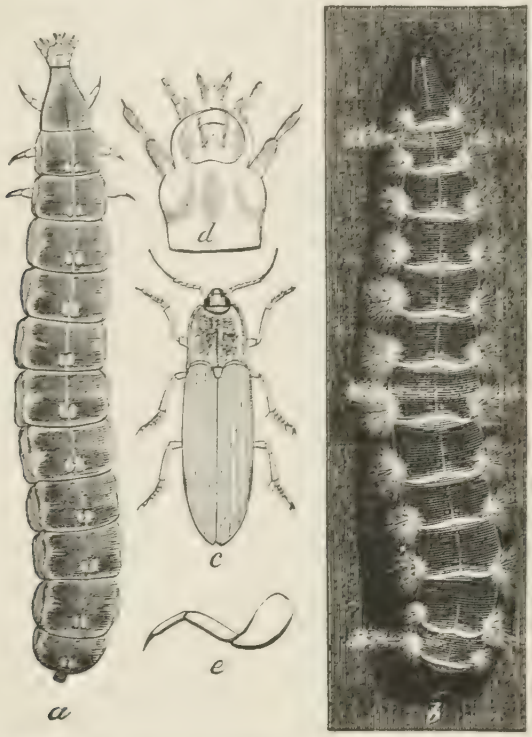
ARACHNIDA.

87. *Filistata capitata.*
138. *Nephila plumipes.*

During the month of August several people, observing the interest I took in the insects of the country, brought me many specimens collected from the same range frequented by myself. On the 10th of that month a young man brought me a single living specimen of a luminous elaterid larva. His captive appeared so curious and rare in his eyes that he demanded the price of five dollars for it. This I was hardly able to afford, and the collector allowed his specimen to perish before he would accept anything less for it. Strange to say, his first demand was three times this amount. The specimen was taken at Covington, La., in the eastern part of the State, and nearly due east of New Orleans. My examination of it was quite limited and in the evening, but sufficient to satisfy me that it answered very closely to the description given of a specimen by Samuel F. Clarke, of Baltimore, Md., in a letter published in an article upon the subject by Professor Riley in the third volume of the American Entomologist, page 201. This figure represents the appearance of this interesting larva so well that I take the liberty of reproducing it. From the article just referred to, I quote the following information. The author states that, "We have

Vol. VII, No. 22. Washington, D. C. Sept. 4, 1884.

on several occasions found this luminous larva in Missouri, usually in cellars, and have in vain endeavored to rear it to the perfect state. The accompanying figure, made some years ago for an article on luminous larvæ, not yet published, will serve to indicate its character, and



LUMINOUS LARVA: *a*, dorsal view; *b*, do., in dark; *c*, probable parent—nat. size; *d*, head of larva; *e*, leg of same—enlarged (after Riley).

the beautiful appearance it presents in the dark. We think Baron Osten-Sacken right in conjecturing this larva to be that of *Melanactes;* yet, when Packard, in his "Guide," speaks of his figure 426 as that of *Melanactes* without qualification, he conveys a wrong impression, since no one has ever decided the matter positively by breeding.

"There is another larva occurring in the more northern States, which has very much the same appearance and the same phosphorescent peculiarities, but which is seldom half as large as that which you send, and which we figure. Both Mr. E. P. Austin and Mr. B. P. Mann, who have studied this northern form, believe that it belongs to *Asaphes*, and probably *A. memnonius*, being led to this conjecture by the presence of *Melanactes* in New England."*

* Prof. C. V. Riley tells me that since writing what I have here quoted from him his opinion has changed, and he now believes that this larva is not elaterid but lampyrid, belonging probably to *Dendrodes*.—R. W. S.

During the year I made many observations upon the habits of that very interesting form, the *Rhomalea microptera*. The results of these I have already published with a plate giving figures of the male and female insect, in Science, vol. 2, December 28, 1883. I have nothing further to add here connected with the life-history of this insect from my own observations.

In the early spring months I collected many of the larvæ of that great brown beetle, the *Strategus julianus*, so abundant in and about the city. The larvæ are of a very large size, of a pale cream color, with coffee-colored heads. They are usually taken under old logs and boards, in dry places. Many of these I kept during the summer, and in numerous instances succeeded in rearing them through the various stages to the perfect insect. This requires several months, but no special care beyond imitating their surroundings in nature. A good history of *Strategus julianus* is given in the Mexican "Naturaliza" by Eugène Dugés, rendering it unnecessary for me to dwell further upon it here.

Tiger beetles made their appearance about the 10th of June, and the two forms of this beautiful genus (*Tetracha*) that I captured were not uncommon after that date, in the open pathways through the fields and parks.

About the same time my collectors commenced bringing in specimens of *Plectrodera scalator*, that large black and white beetle which forms such a striking object in the entomological fauna of the State, more so, even, than *Dynastes tityus*, which is not so common, but far exceeds it in point of size. During the day time specimens of *Mallodon dasystomus* were rarely taken, but after dark, when lights were lit in the houses, this insect very often entered through the open windows. I have frequently at such times taken three or four on the same evening.

Either from their rarity or my ill-fortune in not coming across them, I found *Acanthoderes quadrigibbus*, *Onthophagus hecate*, and *Goes pulcher* to be among the rarest of the *Coleoptera*. Indeed, of the latter two I found but one of each during the entire summer.

One of the most numerous insects is *Euphoria melancholica*, and numbers of them are sure to be captured on every excursion. Mud-daubers are particularly abundant and a great nuisance, as they construct nests in many places, both in the houses and under eaves and porches on the outside. These nests, when broken up, are often good places to find the dead spiders that have been stowed away in them by the owners.

Among the *Diptera*, the undetermined species marked 132 of the genus *Stratiomys* was apparently of very rare occurrence. My entire collection contains but one specimen.

A good representative collection of the dragon-flies of the region, and the species are numerous, were destroyed by ants during my temporary absence from the city for a few days, and I was unable to replace them, as the time had gone by.

HERMAPHRODITE FISHES.

[Translation from Der Naturforscher.*]

It is well known that the combination of two sexes in the same individual is not rare among the lower animals, although far less common than was supposed before the careful and accurate use of the microscope, as, for instance, in the case of many Mollusca and Echinoderms, which were formerly thought to be hermaphrodite, and are now known to be so.

Aristotle announced that the fishes of the genus *Serranus*, a family of percoids, were always hermaphrodite, and this fact has been established by more recent investigations of Carolini in 1787 and Dufosse in 1856. In a paper published by Dr. J. Brock, in Gegenbaur's *Morphologisches Jahrbuch* it is shown that in each of the several species of *Serranus* occurring in the Mediterranean there are certain modifications in the differentiation of the sexual organs into testicles and ovaries, as also the occurrence of a special oviduct in the one and the want of it in the other two species. More recently, in 1876, Syrski has shown that the Gilthead (*Chrysophrys aurata*) is also hermaphrodite. And here, according to Brock, the respective organization of the two organs is again distinct. In general, both in the *Chrysophrys* and the *Serranus*, the testicle lies in the walls of the ovary, but while in the latter the testicle appears only as an appendage of the ovary projecting inward, in the *Chrysophrys* it is much more highly developed, so that, on the other hand, the ovary is to be considered as an attachment to be introduced in the duct of the testicle. Thus in the one genus it is the ovary and in the other the testicle which is most highly developed.

In addition to this Brock states that in a very young specimen of *Serranus* no trace of testicle could be found at all. Continued and repeated investigations on a large number of specimens are desirable.

Dr. E. v. Martens, in referring to these facts, is of opinion that the predominance of the male or of the female organs, hitherto considered as a generic characteristic, may, after all, be only an individual feature, and vary in the same genus and species according to the age or condition of the fish under examination, and that the first stage in the separation of the sexes occurs in a manner similar to what has been observed in many Mollusca.

A periodic separation of the function, at least in the *Serranus*, has been established by Brock, two specimens investigated by him in September having numerous ripe spermatozoids in the testicle, and *vas deferens;* but one had no eggs at all in the ovary, and the other only very young, unripe ones. The fertilization of one individual by another, on account

* Of March 22, p. 116.

of the unequal functions of the two organs, appeared to be the rule, as is the case with many hermaphrodite flowers from the same causes.

Some fishes are only occasionally hermaphroditic, that is to say, among distinctly bisexual fishes hermaphrodites are occasionally observed. Among these belong the mackerel and the carp.

CONTRIBUTIONS TO THE HISTORY OF THE COMMANDER ISLANDS.

NO. 3.—REPORT ON THE MOLLUSCA OF THE COMMANDER ISLANDS, BERING SEA, COLLECTED BY LEONHARD STEJNEGER IN 1882 AND 1883: BY W. H. DALL.

I am informed by Dr. Stejneger that the coast of the Commander Islands, especially Bering Island, is largely rocky, composed chiefly of sandstone, which extends in rocky flats from the shore at the base level of erosion by the waves for quite a distance seaward; from small capes or projections a reef invariably extends seaward, often of volcanic rock. The shore is thus composed of a succession of small bays or bights, none of which afford a harbor, and only one or two an anchorage even for small craft. The beaches at the head of these bays are rocky, or composed of shingle with an occasional strip of sand, the latter especially where streams fall into the sea. There are several lakes at the northern part of Bering Island; the soil is covered with that moss-like coating of sphagnum, reindeer lichen, and *Empetrum* which is characteristic of those regions, with an admixture of the usual boreal herbage, dwarf willows, *Vaccinium*, sedges, and grasses.

These features, taken in connection with the geological character of the rocks, are not favorable to a profuse development of molluscan life of any description.

Upon the wave-worn rocks the stony alga, *Melobesia*, forms crusts, which, by the superposition of successive thin layers, forms masses sometimes 5 or 6 inches thick. In this the boring bivalves find a harbor and congenial quarters. The ponds and lakes afford two *Limnæas* and a small *Pisidium*.

The little black northern slug, *Limax hyperboreus*, is found under protecting chips or pieces of drift-wood near the shore. A few minute helices are its companions. A more exhaustive search would perhaps enlarge the list of Pulmonates, but the usually common and conspicuous genus *Succinea* is singularly absent and hardly likely to have been overlooked. It is quite possible that some of the land shells have been introduced from Kamchatka; the presence of *Patula floccula* is perhaps explainable on this hypothesis, which would account for its absence from the Aleutian Islands.

It is not probable that the Commander Islands have been connected with the mainland of Asia or with any of the Aleutians within recent geological time. The depth of water and the distance which separate

them are too great. Consequently, all the members of their land fauna and flora must be considered as immigrants brought by currents, floating wood or ice, migratory birds, and man. The foxes which inhabited the islands when first discovered undoubtedly reached them on floating ice-fields, as a certain kind of rat or marmot is known to have done one of the Western Aleutians, and as the polar bear almost annually reaches the island of St. Mathew.

Conchologically, next to nothing has been known about the Commander Islands. It is true one of the most remarkable of the mollusks of Northwest America, and the first mollusk described from that region was found by Steller at Bering Island, namely, *Cryptochiton stelleri* of later writers, which is fully described under its Kamchatkan name of "Keru" in his "Kamchatka," page 177. Since then a few references have been made to species collected by Wossnessenski from Bering Sea, part of which were probably obtained at the Commander group, and the presence of *Vitrina* is noticed in the "Voyage of the Vega," from whose collections Westerlund has described some mollusca elsewhere referred to. This appears to be all at present on record in regard to the molluscan fauna of the group, at least my search has not revealed anything else, though it is possible some isolated references have been overlooked. The references of Schrenck and Middendorff are of a general character, and they give no separate list for these islands.

CEPHALOPODA.

Octopus punctatus GABB.

This widely distributed Pacific species was obtained, October 9, at Avatcha Bay, Kamchatka. The specimen is of moderate size. Collector's number, 2759. Mus. Cat. 40903.

Gonatus amœnus VERRILL.

A single not very well preserved specimen, collected June 6, is referred by Professor Verrill to this species. Bering Island; collector's number, 1163. Mus. Cat. 40904.

GASTROPODA.

Nudibranchiata.

Æolidia papillosa (L.) BERGH.

One specimen at Bering Island in the spring of 1883, collector's number, 2349. Mus. Cat. 40905. Three specimens of *Lamellidoris bilamellata* L. var. *Pacifica* Bergh, were also collected, October 1, at Avatcha Bay, Kamchatka; collector's number, 2733. Mus. Cat. 40906.

Pulmonata.

Limax hyperboreus WESTERLUND.

This small species, widely distributed about Bering Sea, was obtained at Bering Island; collectors' numbers, 1406, 1509, and 2469. Mus. Cat.

40907. One specimen, No. 1256, Mus. Cat. 40908, was collected at Petropavlovsk, Kamchatka.

Vitrina exilis MORELET.

Found at Bering Island; collectors' numbers, 1051 and 1509. Mus. Cat. 40909. Abundant on both sides of Bering Sea and on its islands.

Hyalina radiatula ALDER.

H. electrina GOULD; not *H. pura* ALDER, from types.

Found at Bering Island; collector's number, 1518. Mus. Cat. 40910. The *H. viridula* of Menke, published in the same year, is a greenish and rare mountain variety of this species; it seems, therefore, better to follow Jeffreys in preserving Alder's name, which was given to the typical form, for that, and to reserve Menke's name for the variety it was applied to, especially as the typical and normal form is not viridulous.

Conulus pupulus GOULD.

This variety of the ubiquitous *C. fulvus* was described by Dr. Gould from Petropavlovsk, and has been collected there by several travelers, including Dr. William Stimpson and the writer. It was found by Dr. Stejneger on Bering Island. Collectors' numbers, 1516 and 1517. Mus. Cat. 40911.

Patula floccula MORELET.

Helix flocculus MORELET. Journ. de Conchyl., vii, p. 8, July, 1858.
Helix pauper GOULD. Proc. Bost. Soc. Nat. Hist., vi, p. 423, Feb., 1859.
Helix (*Patula*) *ruderata*, var. *opulens* WESTERLUND. Nachr. d. Deutsch. Mal. Ges., 1883, p. 50.

Helix striatella Anthony and its variety *Cronkhitei* Newcomb are widely distributed on the American side of Bering Sea and over the Aleutian Islands, in which area the present form has not been found. The writer and others have confounded the two until recently, when the writer has had an opportunity of making a careful study of by far the best existing series, including those collected by Dr. Stejneger. It is found on the Kamchatkan Peninsula and on Bering Island. Collectors' numbers, 1051, 1514, Mus. Cat. 40912. It was also collected at Bering Island by the Vega expedition. From the specimens of *ruderata* seen by the writer it seems separated, although a larger series might connect them. It is quite distinct from *striatella*. The colored flammules from which it takes its name, and which give it, when living, the aspect of a very diminutive *H. alternata* Say, disappear in dead shells and in shells which were collected living but have been long kept in cabinets. Specimens collected by the writer at Petropavlovsk in 1865, and which showed these markings vividly, are now entirely destitute of them. Even those kept in alcohol have lost them entirely. Nothing of the sort has been observed in the American *H. striatella*. Specimens, collector's number 1256, Mus. Cat. 40913, were also collected at Petropavlovsk, Kamchatka.

Pupilla decora GOULD.

P. decora GLD. Proc. Bost. Soc. Nat. Hist., ii, p. 263, Dec., 1847.
P. borealis MORELET. J. de Conchyl., vii, p. 9, July, 1858.

Found at Bering Island. Collectors' numbers 1051, 1514, and 1517, Mus. Cat. 40914. Dr. Reinhardt identifies this, which is certainly *borealis* MOR., with Gould's prior *P. decora.*

Limnæa ovata DRAPARNAUD.

L. ovatus DRAP. Hist. des Moll. terr., p. 50, pl. ii, figs. 30, 31. 1805. *L. ampla* MIGHELS.

It is to this form rather than to *auricularia* that the *L. ampla* of Mighels is related. From the polished globose, transversely striate, rather loosely rolled, and umbilicated specimens obtained September 2 from Lake Saramraja, on Bering Island, by Dr. Stejneger, the Aleutian form *L.* var. *atkaënsis* Dall differs in being more compact, less polished, with a taller spire, more turreted and less rounded whorls, the coarse malleation of nearly all the specimens, which are also a little more solid and have only a chink in the umbilical place. From *ovata*, *atkaënsis* leads to *sumassi* Baird and *ampla* Mighels. A large series shows a pretty gradual transition so far as the shells are concerned. Collector's number, 1502. Mus. Cat. 40915.

Limnæa humilis SAY.

Specimens which are provisionally referred to the above species were found in a pond near Ladiginsk with *Pisidium æquilaterale* PRIME, July 22, Bering Island. I have no doubt it is common to Eastern Siberia, and it may be identical with Westerland's *L. truncatula* var. *microstoma* DROUET, but at present I am unable to compare specimens. Collector's number, 1267. Mus. Cat. 40916.

The absence of *Succinea* and *Cochlicopa*, not to mention *Aplexa hypnorum*, from these isolated isles is almost as noteworthy as the existence there of large Limnæas. Why *Patula striatella* should be absent when other similar species occur is one of the problems for which we can offer no solution.

GASTROPODA.

(Marine.)

Placophora.

Trachyradsia aleutica DALL.

Bering Island, rather common. Collector's number, 1497. Mus. Cat. 40917. This species was first described from the western Aleutian Islands, and has not yet been reported from either continent.

Tonicella marmorea FABRICIUS.

A single specimen from Bering Island. Collector's number, 2362. Mus. Cat. 40918.

Schizoplax brandtii DALL ex MIDD.

Not uncommon and of rather large size; from Bering Island. Collector's numbers, 1456, 1497, and 2465. Mus. Cat. 40919. Also dry specimens from the beaches.

Cryptochiton stelleri GRAY and MIDD.

Dead valves were picked up on the beaches which were of a much more reddish color than usual in this species. Collector's number, 2567. Mus. Cat. 40920.

Conchophora.

Acmæa pelta ESCHSCHOLTZ.

From Copper Island, collector's number, 1007, Mus. Cat. 40921; and from Bering Island, rather common; collector's numbers, 2779 and 1496, Mus. Cat. 40922; also among the dead shells from the beaches of Bering Island.

Piliscus commodus LOVÈN ex MIDD.

Pilidium commodum MIDD.
Capulacmæd sp., SARS.

Bering Island. Collector's number, 2466. Mus. Cat. 40923.

Crepidula grandis MIDDENDORF.

Bering Island; rare. Collector's number, 2467. Mus. Cat. 40924.

Litorinna sitkana PHILIPPI.

Bering Island. Collector's numbers, 1791, 2464. Mus. Cat. 40925.

Litorina sitkana var. *subtenebrosa* MIDD.

Bering Island. Collector's numbers 2464 and 2779. Also Copper Island. Collector's number 1007. Mus. Cat. 40926.

Lacuna vincta MONTAGUE.

Bering Island, rare. Collector's numbers 1496, very young, and 2779, adult. Mus. Cat. 40927.

LACUNA, subgenus LACUNELLA Dall.

Shell depressed, heliciform, few-whorled, thin, with a strong epidermis; margin of the aperture thin, with a narrow reflexed margin in the adult, continuous with the thin, sharp, unreflected arcuate columella; umbilicated. Operculum paucispiral.

Lacunella refleza, n. s. (pl. II, figs. 1–3).

Shell thin; light to dark chestnut brown, smooth except for faint lines of growth and wrinkles of the epidermis near the suture or in the umbilicus; whorls two and a half to three, the last very much the largest, inflated; suture distinct, the epidermis sometimes wrinkled close to it; nucleus polished; aperture wide, oblique, rounded, the upper end of the

columella and the anterior end of the outer lip approximated, united by a thin glaze of callus; interior polished, brown; base of the aperture rounded, columella arcuate; umbilicus small, narrow, marked by raised wrinkles of epidermis, which sometimes give it a carinated aspect from their abrupt cessation at the umbilical margin; base of the shell smoothly rounded; earlier whorls darker colored than the last. Alt. of shell, 10.0; of aperture, 7.0; max. lat. of shell, 13.8; of aperture, 7.0^{mm}.

Habitat: Pribiloff and Aleutian Islands, Dall. Commander (Bering) Islands, Stejneger.

This group differs from the depressed Lacunæ like *L. neritoidea* in its thin sharp columella, devoid of the excavated groove which gives the genus its name, and in the reflexed margins of the aperture. It was obtained by me in 1873–'74 in the western Aleutians and on St. Paul Island of the Pribiloff Group. The types from which the above description was drawn are from the latter locality. It was compared with forms in the cabinets of the British Museum, Copenhagen, Stockholm, Christiania, Bergen, Berlin, and the private collection of Prof. G. O. Sars, and nothing found resembling it.

There were two quite young specimens of this species in Dr. Stejneger's collection evidently identical with the above. Collector's number, 2779. Mus. Cat. 40928.

Natica russa GOULD.

Bering Island. Collector's number, 1901. Mus. Cat. 40929.

Margarita helicina FABRICIUS.

One young specimen from Bering Island. Collector's number, 2779. Mus. Cat. 40930.

Trichotropis insignis MIDDENDORFF.

Rather common at Bering Island. Collectors' number, 2463. Mus. Cat. 40931.

Cerithiopsis stejnegeri, n. s. (pl. II, fig. 4).

Shell small, thin, purplish, with white nucleus and columella, with seven whorls; nucleus smooth, partly immersed, about one turn in extent, followed by six strongly sculptured, rather rounded whorls; sculpture consisting of four rather deep channels, between which are three strong squarish revolving ridges about as wide as the channels; the channel next the suture nearly obsolete; the most anterior channel bordered anteriorly by an angular ridge, forming the periphery of the base above whose general surface it does not rise and against which the suture runs in the penultimate whorl; the three revolving ridges are nearly equal in size; they increase, if at all, in succession forward, and are crossed by less regular transverse riblets of about equal width; these squarish facets on the ribs, which, in the earlier whorls or in rubbed specimens, become rounded nodules; the pits of the reticulations are quite deep, and in rubbed specimens look like rounded punctures on the early whorls. The transverse riblets are less strong in the channels and

become evanescent in some specimens, and especially on the last whorl, though the facets persist. The riblets do not usually pass on to the base, which is rounded, inflated, and, except for the rather strong and not very regular transverse sculpture, is smooth or has no revolving sculpture; mouth rounded, canal very short, columella shorter than the aperture, slightly twisted, outer lip thin, sharp, regularly arched; the upper whorls show the three ridges with their facets or granules, the posterior decidedly smaller than the other two; suture distinct. Lon. of shell, 5.5; of last whorl, 2.5; of aperture, 1.6; max. lat. of shell, 2.0mm.

Habitat: Unalashka, Atka, and Amchitka Islands, of the Aleutian chain, Dall, 1871–4; Bering Island, one specimen, Stejneger, 1882, collector's number, 1496. Mus. Cat. 40932.

This species was first found by the writer in the Aleutian Islands, where it frequents the canals of the yellow incrusting "bread" sponges, which are very common between low and extreme lowest water marks, and resemble the adult form of the genus *Cliona*. I have never found it except by breaking up these sponges. One dead but perfect specimen was collected by Dr. Stejneger.

The species appears most like *C. pulchella* JEFFREYS, of Britain, but has fewer whorls, a rounded instead of an excavated base, is less delicate, and differs in small details of sculpture. None of the Californian forms are like it.

Purpura lima MARTYN.

Not uncommon. Dry shells and egg cases from Bering Island. Collector's number, 2779. Mus. Cat. 40933.

Trophon truncatus STRÖM.

T. truncatus Ström. G. O. Sars, Moll. Arct. Norv., fig. 9.

Bering Island. Collector's number, 2786. Also from Petropavlovsk, Kamchatka, 2629. Mus. Cat. 40934.

Strombella callorhina DALL, var. *stejnegeri* (pl. II, figs. 5, 6).

One fresh specimen from the beach at Bering Island. It is slightly more elongated than the original specimen from the *Callorhinus* rookery at St. Paul Island, Pribiloff Islands, and presents other characters, which, if constant, would separate it perhaps specifically. The shell has five and a half whorls (the nucleus is gone) and presents indications of about nine obscure irregular transverse ribs; the surface sculpture where preserved is fine and sharp, like that of *Chrysodomus kroyeri;* the epidermis pale brown, extremely thin, and dehiscent. The shell has a grayish green tint, perhaps partly from a confervoid growth, the aperture as in my figure of *Strombella callorhina*, the margin inside yellowish, the throat livid white, the columellar side with a touch of dull purple. Lon. of shell, 60.0; of last whorl, 40.0; of aperture, 28.5mm. Max. lat. of shell, 25.0; of aperture, 16.5mm. Mus. Cat. 40935.

It is a little singular that both the known specimens should come

from localities where the fur-seals are preserved for commercial purposes, and none from anywhere else.

Chrysodomus liratus MARTYN.

Bering Island. Collector's number, 2783. Mus. Cat. 40936.

Chrysodomus spitzbergensis REEVE.

Fine, strong specimens from Bering Island on the beaches. Mus. Cat. 40937.

Buccinum cyaneum var. **moerchianum** FISCHER.

Volutoharpa moerchiana Fischer.

A few dry and some living specimens from Bering Island. Collector's number, 2779. Mus. Cat. 40938.

These specimens were notably heavy, short, thick, dark, and dull colored, features due probably to the influences of the very exposed and stormy coast upon which they live, as observed in other mollusks elsewhere.

PELECYPODA.

Pholas crispata LINNÉ.

Dry valves from the beach, Bering Island. Mus. Cat. 40939.

Pholadidea penita CONRAD.

With the last; also living in large masses of *Melobesia*, which form accumulations almost like coral on the exposed coast. Collector's numbers, 1909, 2486. Mus. Cat. 40940.

Saxicava rugosa LINNÉ

Bering Island. Large dead valves on the beach, and living ones in situ in masses of *Melobesia*. Collector's number, 1791. Mus. Cat. 40941.

Mya truncata. LINNÉ.

Bering Island; valves from the beach. Mus. Cat. 40942.

Siliqua patula DIXON.

With the last. Mus. Cat. 40943.

Mactra falcata GOULD.

With the preceding. Collector's number 1711. Mus. Cat. 40944.

Macoma (*edentula* Brod. & Sby. var.?) **Middendorffi**. DALL.

Tellina edentula Middendorff, Sib. Reise, p. 259, pl. xxi, fig. 1 *only*. 1850.

A fine living specimen of this rare and singular species from Bering Island. Collector's number 2572. Mus. Cat. 40945. There is some reason to suppose this specifically distinct from the original *edentula*.

Tapes staminea CONRAD.

Bering Island on the beaches. Mus. Cat. 40946.

Cardium grönlandicum CHEMNITZ.

With the last. Mus. Cat. 40947.

Cardium blandum GOULD.

Bering Island. Collector's number 2571. Mus. Cat. 40948.

Pisidium aequilaterale PRIME.

In ponds near Ladiginsk and the village, July 22 and 29. Bering Island. Identified by Mr. Prime from specimens sent for examination. Collector's numbers 1267, 1337. Mus. Cat. 40949.

Modiolaria discors LINNÉ.

With the next species. Mus. Cat. 40950.

Modiola modiolus LINNÉ.

Bering Island; valves on the beaches. Mus. Cat. 40951.

Mytilus edulis LINNÉ.

With the last, also living, and from Avatcha Bay, Kamchatka. Collector's numbers 1791, 2594. Mus. Cat. 40952.

FAUNAL SUMMARY.

Species of Commander Islands.	Japan.	Kamchatka.	Arctic.	Aleutian.	California.
Gonatus amœnus			*	*	
Aeolidia papillosa					
Limax hyperboreus		*	*	*	
Vitrina exilis	*	*	*	*	*
Hyalina radiatula		*	*	*	
Conulus var. pupulus	*	*	*		
Patula floccula	*	*			
Pupilla decora		*	*	*	
Limnæa ovata		*		*	
Limnæa humilis					
Trachyradsia aleutica				*	
Tonicella marmorea	*	*	*	*	
Schizoplax brandtii		*		*	
Cryptochiton stelleri		*	*	*	*
Acmæa pelta				*	*
Pilisceus commodus	*	*	*	*	
Crepidula grandis	*	*	*	*	
Litorina sitkana	*	*	*	*	*
Litorina var. subtenebrosa	*	*	*	*	
Lacuna vincta	*	*	*	*	*
Lacunella reflexa			*	*	
Natica russa		*		*	
Margarita helicina	*	*	*	*	
Trichotropis insignis		*		*	
Cerithiopsis stejnegeri				*	
Purpura lima		*	*	*	*
Trophon truncatus			*	*	
Strombella var. stejnegeri			*		
Chrysodomus liratus			*	*	*
Chrysodomus spitzbergensis		*	*	*	
Buccinum var. mörchianum				*	
Pholas crispata	*				*
Pholadidea penita	*				*
Saxicava rugosa	*	*	*	*	*
Mya truncata	*	*	*	*	
Siliqua patula		*		*	*
Mactra falcata			*	*	
Macoma middendorfii				*	
Tapes staminea		*		*	*
Cardium grönlandicum		*	*	*	
Cardium blandum		*		*	
Pisidium aequilaterale				*	
Modiolaria discors	*	*	*	*	
Modiola modiolus	*	*	*	*	*
Mytilus edulis	*	*	*	*	*

Out of forty-five species and varieties thirty-nine are common to the Aleutian chain and three of the remainder may probably turn up there in the future. Twenty-nine are common to Kamchatka, and six more are likely to reach that peninsula. Twenty-seven are Arctic species, all of which are common to the Aleutians, and, with one or two possible exceptions, to Kamchatka also. Seventeen species are common to North Japan, and fourteen to California, while only two are, for the time, taken as peculiar.

These figures show that the fauna of the Commander Islands, as far as known, is intimately related to the general Arctic fauna, and especially to the Aleutian fauna, somewhat less so to the Kamchatka fauna, but presents in itself nothing distinctive. While the faunal aspect of the mollusca is boreal, there is a number greater than might be expected of species common to Japan and California, of which the two Pholads are the most noteworthy, as they have not yet been indicated from the Aleutian Islands, though it seems hardly possible if found living at the one locality that they can be absent from the other.

The collection, though small, is valuable as closing a gap in our knowledge of the geographical distribution of the mollusca of the North Pacific, and the slight but still interesting confirmatory zoölogical evidence which it adds to the hydrographic determinations which have shown that the main current of the sea between Kamchatka and the Aleutian chain is a cold set of Arctic water southward, and that no perceptible warm northward tropical stream or branch of the Kuro Siwo can be traced zoölogically or hydrographically in this direction.

JULY 25, 1884.

NOTE ON THE STERNOPTYCHIDÆ.

By THEODORE GILL.

(See plate II, fig. 7.)

The genus *Sternoptyx* was established in 1781 by Hermann for a remarkable type of fishes which was taken for one of his families by A. Duméril, the first to recognize families in Ichthyology. The family was accepted or named over by several later naturalists. Dr. Günther, nevertheless, did not recognize any of his predecessors when he likewise proposed the name *Sternoptychidæ*, and simply referred to the synonymy of the family "Scopelini, part, Müll., Berl. Abhandl., 1844, p. 184." An important article on the family by Handyside has also been universally overlooked, even by Bleeker in his communications on the Fishes of Celebes,* and by Dr. Günther the family is attributed to "pelagic or deep-sea fishes from the Mediterranean and Atlantic." An examination of specimens of the two typical genera *Sternoptyx* and *Argyropelecus* renders it evident that the type is of unusual interest, and hence I am led to make the present preliminary communication.

* The new species *S. celebes* was described.

The family should be limited to the genera *Sternoptyx* and *Argyropelecus*, constituting the subfamily *Sternoptychina* of Günther. The *Chauliodontina* form a neighboring family, and the *Cocciina* are but distantly related. The *Sternoptychidæ*, thus restricted, exhibit a number of peculiarities and noteworthy characteristics. The most striking, in some respects, is the mode of articulation of the scapular arches. These are connected with and impinge on the occiput behind and on each other, and are otherwise free from the cranium. Mr. J. A. Ryder, to whom I communicated this observation, informed me that he had noticed the same peculiarity in *Cyclothone*. This near relation and possible congener of *Gonostoma*, and apparently member of the family *Chauliodontidæ*, is thus shown to be allied to the *Sternoptychidæ*. The peculiarity in question seems to entitle the fishes exhibiting it to be isolated from the others, and the name *Iniomi** may be used for the group.

By Dr. Günther, and various others following him, the *Sternoptychidæ* are said to have "a rudimentary spinous dorsal fin." This statement is the result of a misapprehension or misinterpretation of morphological facts. There is nothing like a true "rudimentary spinous dorsal fin." To call the projection of a neural spine or the result of "several neural spines being prolonged beyond the muscles" a *fin* is to exhibit or convey a gross misconception of the morphology of fishes.

STERNOPTYCHIDÆ.

FAMILY SYNONYMS.

=Sternoptyges, *Duméril*, Zoologie Analytique, p. 150, 1806.
=Sternottidi, *Rafinesque*, Caratteri di alc. nuovi gen. e n. sp. d Animale, etc., di Sicilia, 53 ord., 1810.
<Pomanchia, *Rafinesque*, Analyse de la Nature, 25 fam., 1815.
=Sternoptixinæ, *Handyside*, Edinburgh New Phil. Journ., v. 27, p. 326, 1839.
=Sternoptygoidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xxxii, 1859.
<Sternoptychidæ, *Günther*, Cat. Fishes in Brit. Mus., v. 5, p. 383, 1864.
=Sternoptychidæ, *Gill*, Arrangement Fam. of Fishes, p. 15, 1872.
=Argyropeleci, *Fitzinger*, Sitzungsber. k. Akad. der Wissensch. (Wien), v. 67, 1 Abth., p. 33, 1873.
<Sternoptychidæ, *Jordan and Gilbert*, Syn. Fishes, N. Am., p. 283, 1882.

SUBFAMILY SYNONYMS.

<Sternoptygia, *Rafinesque*, Analyse de la Nature, 1. s. fam. of 25 fam., 1815.
=Sternoptygini, *Bonaparte*, Fauna Italica, Pesci, fols. 119, 121, 1840.
=Sternoptygini, *Bonaparte*, Consp. Syst. Ichthyologiæ, 1850.
=Sternoptychina, *Günther*, Cat. Fishes in Brit. Mus., v. 5, p. 384, 1864.
Salmonoides gen., *Cuvier*.
Salmonides gen., *Latreille*.
Salmonidæ Salmoninæ gen., *Swainson* (ii, 291).
Scopelidæ s. fam., *Banaparte*.
Scopelidæ gen., *Adams*.
Scopelini gen., *Müller*.
Characines gen. dub., *Duméril*.

Iniomes with a compressed ventradiform† body, carinated contour,

*Ἰνίον (gen. ἰνίου), nape and ὦμός, shoulder.
†Ventradiform, a form projecting in the ventral or preanal region.

deeply and obliquely cleft or subvertical mouth, whose upper margin is constituted by the supra-maxillaries as well as inter-maxillaries, branchiostegal arch near and parallel with lower jaw, scapular arch with an inferior projection, and with one or more of the neural spines abnormally developed and projecting above the back in advance of the dorsal fin.

The two genera of the family are so distinct that their relations in a general system may be expressed with apparent propriety under special subfamily names.

STERNOPTYCHINÆ.

Sternoptychids with the abdominal outline nearly continuous in a sigmoid curve, a single produced spike-like neural spine in front of the dorsal fin, and about five branchiostegal rays.

The skeleton of *Sternoptyx diaphanus* is represented on plate II, fig. 7.

ARGYROPELECINÆ.

Sternoptychids with the abdominal outline abruptly contracted in advance of the anal fin, several produced neural spines constituting a serriform ridge in advance of the dorsal fin, and about nine branchiostegal rays.

THE OSTEOLOGIGAL CHARACTERISTICS OF THE LUTJANINÆ.

By THEODORE GILL.

The subfamily Lutjaninæ contains a number of fishes, representing in the American waters seven genera, which manifest considerable diversity in structural characteristics, but which nevertheless have many features in common. The group appears, on the whole, to be homogeneous, although it may be advisable hereafter to dissever its constituents into two subfamilies. All are, however, distinguished from the typical Sparidæ by the absence of distinct tubercles from the cranium for articulation with the epipharyngeal bones, the development of enlarged apophyses for articulation with the palatine and preorbital bones, and the atrophy of parapophyses of the anterior vertebræ. The parapophyses may be said to be absolutely wanting to the anterior four vertebræ and but faintly developed on the fifth and sixth, or even seventh, while the ribs are inserted in sockets or pits in the bodies of all six, creeping higher and higher upwards as they approach the cranium, and fitting into pits at the bases of the neurapophyses of the second and first (and, it may be, the third) vertebræ. Such are the characters common even to the extremes, and the differences between them are slight and only of degree. Further, all the genera have the form and articulations of the maxillary bones characteristic of the Pristipomids, Serranids and related types, and unlike those of the Sparids.

The genera of this group were long ago recognized by me, and the osteology abundantly confirms their validity. Professor Jordan has, however, been unable to recognize generic characters for the exterior, and I have therefore been impelled to a task too long delayed, and herewith submit the cranial characteristics of the various genera. I am indebted to my venerable friend, Professor Poey, for the skeletons which have enabled me to formulate the characters. They represent almost all of the species found in the Cuban waters. Professor Poey long ago appreciated the importance of osteology for the full knowledge of the relationships of fishes, and published, in 1871,* a synopsis of the Lutjaninæ, in which he adopted the genera here characterized.

As Professor Jordan will soon publish a revision of the American species of Lutjaninæ and give the external characteristics of the genera, this article is limited to the exhibition of the skeletal features, and only such of them as appear to be most salient, and therefore best fitted for diagnosis.

Professor Jordan has recognized the characteristics of the pterygoid armature and number of gill-rakers in the case of the several genera.

It may be that a distinct family should be constituted for the Lutjaninæ and Hoplopagrinæ (to be called Lutjanidæ), with the characters above indicated as their most essential features. I have not been able, however, to examine the osteology of the remarkable and eccentric *Hoplopagrus Guentheri*.†

LUTJANINÆ.

Synonyms as subfamily names.

<Mesopriontiformes,‡ *Bleeker*, Enum. Sp. Piscium in Archipel. Indico, p. xix, 1859. (Composed chiefly of Sparidæ; not defined.)
=Lutjaninæ, *Gill*, Proc. Acad. Nat. Sc. Phila., 186, 2p. 446, 1862 (defined).
>Lutjanini, *Poey*, Repertorio Fisico-Natural de Cuba, t. 2, p. 205, 1868 (not defined).
>Platyiniini, *Poey*, Repertorio Fisico-Natural de Cuba, t. 2, p. 205, 1868 (not defined.)
=Lutjanini, *Poey*, Annals Lyceum Nat. Hist. N. Y., v. 10, p. 58, 1871 (described).
<Spariformes‡ (Lutjanini§) *Bleeker*, Archives Néerlandaises Sc. Exactes et Nat., t. 11, p. 270 (275); Systema Percarum, i, p. 24 (29) 1876; Atlas Ich. des Indes Néerlandaises, t. 8? 1876?
=Lutjaninæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 546, 1882.
=Lutjaninæ, *Gill*, Proc. U. S. Nat. Mus., v. 7, p. —, 1884 (cranial characteristics defined).
Percinæ gen., *Bonaparte et al.*
Serraninæ gen., *Günther et al.*

Synonym as family name.

<**Mesopriontoidei**, *Bleeker*, Enum. Sp. Piscium in Archipel. Indico, p. 19, 1859.

In addition to the osteological characters enumerated (which are probably also shared by the Hoplopagrinæ), the Lutjaninæ are, as a

*Genres des Poissons de la faune de Cuba appartenant à la famille Percidæ. Par Felipe Poey. <Annals Lyceum Nat. Hist. New York, vol. 10, pp. 27–79 (Lutjaninæ <pp. 58–71), 1871.

†Hoplopagrus Guentheri, *Gill*, Proc. Acad. Nat. Sci., 1861, p. 78; 1862, p. 253.

‡"Subfamilia" of Bleeker.

§"Phalanx" of Bleeker.

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subfamily, distinguished by the normal narial apertures anterior near the posterior, the acute teeth, and the development of teeth on the palatine as well as vomer.

ANALYSIS OF GENERA.

I. Interorbital area not flat nor separated from the occipital region, with the median and lateral crests procurrent on it, and with the frontal narrowed forwards.

1. Prefrontals with the articular facets arising from diverging V-shaped ridges; basisphenoid with an anterior lobiform extension.

a. Fronto-occipital crest ceasing far from point of frontal; prefrontals with posterior areas impressed, long and cribriform; pterygoids edentulous; gill-rakers few ..... LUTJANUS.

b. Fronto-occipital crest continued on ethmoid; prefrontals with posterior areas short and excavated above and in front; pterygoids dentigerous; gill-rakers numerous ..... OCYURUS.

2. Prefrontals with the articular facets developed from simple tubercles, and not V-shaped ridges; basisphenoid not lobigerous.

a. Prefrontals with the posterior areas cribriform; ophisthotics with nearly simple processes; vomer with an elongated posterior dentigerous crest; pterygoids dentigerous ..... RHOMBOPLITES.

b. Prefrontals with the posterior areas solid and somewhat tumid; opisthotics with bifurcate processes; vomer incurved and toothless behind its chevron; pterygoids toothless ..... TROPIDINIUS.

II. Interorbital area flat, separated by a transverse line of demarcation from the occipital, by which the median as well as the lateral crests are limited; frontals wide in front.

1. Frontals not cavernous, but simply normally perforate; postfrontals, behind, with funnel-shaped foramina; supraorbital margins crenate.

a. Periotic region much swollen outwards, and with the bones thin and polished. PLATYINIUS.

b. Periotic region little convex, and with the bones thick and unpolished.. ETELIS.

2. Frontals cavernous (like those of Sciaenids) with longitudinal osseous bars leaving interspaces in front of tranverse ridge, and on each side near the front; prefrontals, behind, with simple foramina for olfactory; supraorbital margins smooth ..... VERILUS.

DESCRIPTIONS OF CRANIAL CHARACTERISTICS.

LUTJANUS.

PARTIAL SYNONYMY.

=Lutjanus, *Bloch*, t. 7, p. 324, 1797.
=Lutjanus, *Gill*, Proc. Acad. Nat. Sc. Phila., 1862, pp. 236–237.
=Lutjanus, *Poey*, Annals Lyceum Nat. Hist. N. Y., v. 10, p. 62, 1871.

Interorbital area not flat nor separated from the occipital region, with the median and lateral crests procurrent on it, and with the frontal narrowed forwards; prefrontals with the articular joints arising from diverging V-shaped ridges with posterior areas impressed and often

cribriform; basisphenoid with anterior lobiform extension; fronto-occipital crest ceasing far from front of frontal; pterygoids edentulous; gill-rakers few.

Type *L. lutjanus*, Bloch.

OCYURUS.

PARTIAL SYNONYMY.

=Ocyurus, *Gill*, Proc. Acad. Nat. Sc. Phila., 1862, p. 236, 1862.
=Ocyurus, *Poey*, Annals Lyceum Nat. Hist. N. Y., v. 10, p. 60, 1871.

Interorbital area not flat nor separated from the occipital region, with the median and lateral crests procurrent on it, and with the frontal narrowed forwards; prefrontals with the articular facets arising from diverging V-shaped ridges with posterior areas short and excavated; basisphenoid with an anterior lobiform extension; fronto-occipital crest continued on ethmoid; pterygoids dentigerous; gill-rakers numerous.

Type *O. chrysurus* = *Sparus chrysurus*, Bloch.

RHOMBOPLITES.

PARTIAL SYNONYMY.

=Rhomboplites, *Gill*, Proc. Acad. Nat. Sc. Phila., 1862, p. 237.
=Rhomboplites, *Poey*, Annals Lyceum Nat. Hist. N. Y., v. 10, p. 61, 1871.

Interorbital area not flat nor separated from the occiptal region, with the median and lateral crests procurrent on it, and with the frontal narrowed forwards, prefrontals with the articular facets developed from simple tubercles and not V-shaped ridges; with the posterior areas cribiform; opisthotics with nearly simple processes; basisphenoid not lobigerous; vomer with an elongated posterior dentigerous crest; pterygoids dentigerous.

Type *Rhomboplites aurorubens*=*Centropristes aurorubens*, Cuv. & Val.

TROPIDINIUS.

PARTIAL SYNONYMY.

=Tropidinius, *Gill*, (MSS.); *Poey*, Repertorio Fis.-Nat. de Cuba, t. 2, p. 296, 1868.
=Tropidinius, *Poey*, Annals Lyceum Nat. Hist. N. Y., v. 10, p. 65, 1871.

Interorbital area not flat nor separated from the occipital region, with the median and lateral crests procurrent on it, and with the frontals narrowed forwards; prefontals with the articular facets developed from simple tubercles and not V-shaped ridges, with the posterior areas solid and somewhat tumid; opisthotics with bifurcate processes; basisphenoid not lobigerous; vomer incurved and toothless behind its chevron; pterygoids toothless.

Type *Tropidinius dentatus*=*Apsilus dentatus*, Guich.=*Mesoprion arnilla*, Poey.

APRION § PLATYINIUS.

PARTIAL SYNONYMY.

= Platyinius, *Gill*, Proc. Acad. Nat. Sci. Phila., 1862, p. 236, 448.
= Platyinius, *Poey*, Annals Lyceum Nat. Hist. N. Y., vol. x, p. 66, 1871.

Interorbital area flat, separated by a transverse line of demarcation from the occipital by which the median as well as lateral crests are limited; frontals wide in front, not cavernous but simply normally perforated; postfrontals behind with funnel-shaped foramina; supraorbital margins crenate. Periotic region much swollen outwards, and with the bones thin and polished.

Type *Aprion macrophthalmus*, = *Centropristis macrophthalmus*, Müll. & Tr. = *Mesoprion vorax*, Poey.

ETELIS.

PARTIAL SYNONYMY.

= Etelis, *Cuv. & Val.*, Hist. Nat. des Poissons, t. ii, p. 127, 1828.
= Etelis, *Gill*, Proc. Acad. Nat. Sci. Phila., 1862, p. 447.
= Etelis, *Poey*, Annals Lyceum Nat. Hist. N. Y., vol. x, p. 67, 1871.

Interorbital area flat, separated by a transverse line of demarcation from the occipital by which the median as well as lateral crests are limited; frontals wide in front, not cavernous but simply normally perforate; postfrontals behind with funnel-shaped foramina; supraorbital margins crenate. Periotic region little convex, and with the bones thick and unpolished.

Type *E. carbunculus*, Cuv. & Val.

VERILUS.

SYNONYMY.

Verilus, *Poey*, Mem. Hist. Nat. de Cuba, t. 2, p. 125.
Verilus, *Poey*, Annals Lyceum Nat. Hist. N. Y., vol. x, p. 70, 1871.

Interorbital area flat, separated by a transverse line of demarcation from the occipital, by which the median as well as lateral crests are limited; frontals wide in front, cavernous (like those of Sciænids), and with longitudinal osseous bars leaving interspaces in front of transverse ridge and on each side near the front; prefrontals behind with simple foramina for olfactory nerves; supraorbital margins smooth.

Type *V. sordidus*, Poey.

A CONTRIBUTION TO THE TERMINOLOGY OF ICHTHYOGRAPHY.

By THEODORE GILL.

A desideratum of ichthyography, or descriptive ichthyology, has been a system of terminology by which the forms characteristic of various types of fishes could be tersely and aptly expressed. In common with others, I have hitherto employed phraseology expressive of likeness to certain specific forms, such as Perciform, Spariform, Scombriform, Cottiform, Gadiform, &c. But such terms are often taken too literally, or, when explained away, lose almost all significance. When the constituents of natural families are compared, however, as Professor Agassiz long ago suggested,* there is generally (not always) found to be a certain similarity which on analysis often proves to be the result of the extension of the body in a definite direction. This tendency can be expressed by terms derived in the same way as many generally accepted ones (*e. g.*, dorsad, caudad, ventrad, &c.) with the suffix form. Some others can be used with current meanings. The advantage of such a course will be (1) to direct immediate attention to the principal element of the form, (2) to dissever the general idea from a special one, and (3) to insure conciseness and absence, or at least a minimum, of periphrasis in description. I shall now give only some illustrations:

I.

The form most eminently adapted for direct horizontal progression in the water is that exemplified in the Tunny and its relations, Trachurus, Gasterosteus, &c. It is the *fusiform* contour.

In most fishes there is, however, a greater or less deviation from this form to enable the fish more readily to descend or ascend or otherwise accommodate itself to its most advantageus movements.

II.

In most forms extension takes place in an upward direction. In the Perches and many others the tendency of extension is upwards above the shoulders or in the region of the front of the back. This may be called *dorsadiform.*

* The idea of taking form as a family characteristic in ichthyology originated with de Blainville in 1816. In the "Squammodermes" or scaly fishes, he defined the families by their form. *Metrosomes*, "de forme ordinaire"; *Subencheliosomes*, "longue et subcylindrique;" *Encheliosomes*, "longue et cylindrique," &c. Some of these are repeated under several orders, *e. g.*: Subencheliosomes under the Tetrapodes Abdominaux (*Cobites*), T. Thoraciques (*Gobies, Callionymes*), T. Jugulaires, and Dipodes (*Gymnotes*). How little of precision was connected with de Blainville's idea may be inferred from the fact that under Metrosomes he embraced *Esox, Clupea, Salmo, Cyprinus* (Abdominaux), *Labrus* (Thoraciques), and *Gadus* (Jugulaires).

In the Equulids, among others, the extension is in the region just behind the cranium or about the nape, and hence such may be called *nuchadiform*.

In the Patæcids the extension is to the direction of the front of the head, and a *frontadiform* outline results.

III.

In certain other types it is the inferior region that is expanded.

In the Sternoptychids the extension is downwards in front of the anal region; the resulting shape is the *ventradiform*.

In the Zenids and Gerrids the tendency of expansion is about the thoracic region; it may (taking advantage of a frequently used analogy) be designated the *sternadiform*.

IV.

Certain other forms do not manifest any decided deviation one way or another in a vertical direction.

The Centrarchids, Cichlids, Labrids, Pimelepterids (or Cyphosids, if it is deemed best), and many others have the dorsal and inferior outlines almost exactly inverted, so that, if the body (exclusive of head) could be simply folded lengthwise, the two margins would be found to be nearly coincident. The shape thus constituted may be designated *antadiform*.

In the Chætodontids, an apparent expansion is manifested by the encroachment of the skin and scales on the soft dorsal and anal fins, and they may be distinguished as *pinnadiform*.

In many fishes, such as the Coryphænids, Uranoscopids, Batrachids, Triglids, &c., the body regularly increases in height or vertical extension towards the head, and they are consequently *antrorsiform*.

In Lampris, the height is greatest considerably in advance of the middle, and hence an *oviform* outline ensues.

In the Trichiurids and some others the body is much elongated and greatly compressed, and they have quite generally and appropriately been called *tæniiform* or ribbon-shaped.

V.

Some exceptional deviations are manifested by very different forms.

The Toxotids and Amphisilids are both distinguished by a sort of depression or flattening of the dorsal outline from the head backwards to the dorsal fin. The name *retradiform* may be used to express this feature.

VI.

Other names, derived from special types, may be used inasmuch as they already have some currency and are not apt to produce much misconception. Such are *anguilliform*, *platessiform*, *soleiform*, *squaliform*, &c.

DESCRIPTION OF A NEW SPECIES OF COOT FROM THE WEST INDIES.

By ROBERT RIDGWAY.

Fulica caribæa, sp. nov.—SP. CHAR. Similar to *F. americana*, but differing in the slenderer bill and in the form and color of the frontal shield. Frontal shield oval or elliptical, much wrinkled, .70 — .90 of an inch long, and .35 — .50 wide, in the breeding season; its color pale brownish (whitish in life ?) instead of chestnut or liver-brown, as in *F. americana*.

Hab.—Islands of Guadeloupe and Saint John's, Lesser Antilles.

A male and female from Saint John's (F. A. Ober, coll.) and an adult from Guadeloupe (L. Guesde, coll.) agree in the above characters which, on comparison with an extensive series of *F. americana*, appear sufficient to justify their separation as a resident local species or race. The plumage is quite identical with that of *F. americana*, and the bill is marked with the same well-defined subterminal brown spots; but there is no trace whatever of the dark color on the frontal shield, always present and conspicuous in *F. americana*.

The Museum possesses a specimen of *F. americana*, in breeding dress, from Grenada.

A REVIEW OF THE AMERICAN SPECIES OF EPINEPHELUS AND RELATED GENERA.

By DAVID S. JORDAN and JOSEPH SWAIN.

In the present paper we give the synonymy of the species of *Epinephelus* and allied genera known from American waters, an analytical key by which the species recognized by us may be distinguished, and full descriptions of most of the species which we have been able to examine. These specimens belong in part to the United States National Museum and in part to the Museum of the University of Indiana.

The group here discussed corresponds very nearly to the genus *Epinephelus* in the sense in which it is understood in the later papers of Bleeker. The *Epinephelini* include, as understood by us, those *Serranina* which have the maxillary provided with a supplemental bone, the teeth of the inner series in both jaws depressible, the front of each jaw with two fixed canines which are sometimes obsolete, the dorsal fin continuous, the soft dorsal with 15 to 19 rays, and the bones of the cranium without prominent spinous ridges. This definition excludes the nearly related genera *Stereolepis* and *Polyprion* as well as the more remote *Serranus*, *Anthias*, *Paranthias*, &c. As further distinguishing the *Epinepheli* from *Serranus* and *Anthias* we have the small scales and the number of the dorsal spines, which in *Serranus* is always ten, and

in the *Epinepheli* is generally eleven (in one genus nine and in a single species ten). There can, we are sure, be no possible question of the propriety of separating *Epinephelus* at least as a whole from *Serranus* (typified by *Serranus scriba*). The relations of *Epinephelus* and *Serranus* are indeed not very close, and only in an artificial grouping could they be confounded.

Whether it is desirable to subdivide *Epinephelus* into genera depends somewhat on the value which we wish to give to a genus. As a whole, the species certainly form a natural group. It is also true that they divide readily into several smaller groups, several of which are well defined, easily recognized, and apparently natural. In the present paper six of these are regarded as distinct genera, though we should not seriously object to regarding them as subgenera of a single genus *Epinephelus*, as in some other publications we have already done. Four of these groups (*Mycteroperca*, *Alphestes*, *Promicrops*, *Dermatolepis*) are characteristically American. The others (*Epinephelus*, *Enneacentrus*) are cosmopolitan. *Epinephelus* is the central genus of the group. *Epinephelus* and *Enneacentrus* are also much less homogeneous than the other genera, and perhaps may admit of further subdivision.

We cannot, however, regard the several groups (*Schistorus*, *Hyporthodus*, *Labroperca*, *Petrometopon*, *Menephorus*, &c.) as being worthy of consideration as genera on the basis of the definitions which they have thus far received. While some of these may be possessed of "cranial characters" sufficiently distinctive, it remains to be shown what these cranial characters are, and that they are not, like other characters, subject to intergradation, so their existence becomes merely a question of more or less.

As the purpose of this paper is, however, to facilitate the identification of species, we proceed at once to an analysis of the chief external characters which distinguish the six genera admitted by us.

ANALYSIS OF GENERA ALLIED TO EPINEPHELUS.

a. Scales or some of them more or less ctenoid; canines distinct in front of each jaw; body oblong, elongate; preopercle more or less serrate.

b. Dorsal spines eleven (ten in *Epinephelus analogus*).

c. Anal fin elongate, its rays III, 11 or III, 12; caudal fin lunate or truncate; spines slender, those of the anal fin graduated; lower jaw strongly projecting; cranium rather broad between the eyes, posteriorly with three subequal crests; scales small, largely cycloid, those of the lateral line simple; pyloric cœca few (12 to 20); soft dorsal with 16 to 18 rays.

MYCTEROPERCA, 1.

cc. Anal fin short, its rays III, 8 or III, 9; spines rather robust; posterior part of cranium with the lateral crests little developed; scales ctenoid.

d. Scales of lateral line each with 4 to 6 strong radiating ridges; cranium extremely broad and depressed between the eyes; the anterior profile a little concave; lower jaw projecting; pyloric cœca excessively numerous; second dorsal with 16 rays; caudal much rounded; size very large.

PROMICROPS, 2.

dd. Scales of lateral line simple; cranium narrow between the eyes; pyloric cœca few or many; soft dorsal with 15 to 17 rays.

e. Preopercle without a strong antrorse spine at its angle....EPINEPHELUS, 3.

ee. Preopercle with a single (rarely 2) strong spine directed downward and forward, near its angle .....ALPHESTES, 4.

bb. Dorsal spines nine: scales ctenoid, those of the lateral line simple; spines rather strong; cranium rather narrow between orbits, its lateral crests posteriorly little developed; soft dorsal with 14 or 15 rays; size small; pyloric cœca few.

ENNEACENTRUS, 5.

aa. Scales all smooth; canines very small or obsolete: head rather small, the body comparatively deep: soft dorsal unusually long of 19 or 20 rays: spines low.

DERMATOLEPIS, 6.

I.—Genus MYCTEROPERCA.

MYCTEROPERCA, Gill, Proc. Ac. Nat. Sci. Phila., 1863, 80 (*olfax:* diagnosis erroneous).
TRISOTROPIS, Gill, Proc. Ac. Nat. Sci. Phila., 1865, 104 (*guttatus=cardinalis*).
PAREPINEPHELUS, Bleeker, Systema Percarum Revisum, 1875, 257 (*acutirostris=scirenga:* diagnosis erroneous).

The species of this genus closely resemble those of *Epinephelus*, but are distinguished by a number of minor characters, apparently constant, as well as by the differences in the structure of the cranium, described in detail by Professor Gill in the paper on *Trisotropis*, above cited.

ANALYSIS OF SPECIES OF MYCTEROPERCA.

a. Second dorsal spine shorter than third, the third and fourth longest.

b. Margin of anal fin posteriorly concave, its middle rays much exserted.

c. Center rays of caudal scarcely produced, not two-thirds length of head; canine teeth moderate; angle of preopercle little salient; scales small (lat. l. about 130); color plain red; vertical fins without black edgings .....ROSACEA, 1.

cc. Outer rays of caudal much produced, more than two-thirds length of head; preopercle with salient angle; canine teeth strong; scales small (lat. l. 140); color brownish with small darker spots; vertical fins broadly edged with blackish .....FALCATA, 2.

bb. Margin of anal not concave; caudal simply lunate or subtruncate.

d. Body with light and dark cross-bars; anal fin with angular margin, subtruncate posteriorly; preopercle without salient angle; scales small (lat. l. 133); form rather robust.....TIGRIS, 3.

dd. Body without cross-bars; soft parts of vertical fins broadly edged with blue-black, and with a narrow pale margin.

e. General color dusky olivaceous, more or less marbled with darker; no distinct red anywhere and no distinct black spots; pectoral not broadly edged with orange.

f. Interorbital area channeled; angle of preopercle little salient; body slender; caudal little concave; scales smallish (about 120); sides with small faint spots of darker; commissure with yellow-green .....INTERSTITIALIS, 4.

ff. Interorbital space not distinctly channeled.

g. Angle of preopercle salient, armed with stronger teeth.

h. (Nostrils very close together, separated only by a vertical membrane; scales small (about 130); caudal subtruncate, its angles produced; commissure with yellowish; body covered with small round yellowish spots.) .....CALLIURA, 5.

hh. Nostrils well separated; no yellowish spots.

i. (Caudal peduncle with a black spot on each side; body dark brown, the lower half abruptly paler; young specimens; the scales undescribed.) ..... DIMIDIATA, 6.

ii. Caudal peduncle without black spot.

j. Scales very small (about 140); cheeks without distinct dusky stripes; commissure without yellow; caudal distinctly lunate; gill-rakers few, about 12 on lower part of anterior arch. MICROLEPIS, 7.

jj. Scales moderate (about 100); cheeks with radiating dusky stripes; caudal subtruncate, the angles slightly produced; gill-rakers in increased number about 30 on lower part of arch. SCIRENGA, 8.

gg. Angle of preopercle not salient, its teeth scarcely enlarged; gill-rakers rather few.

k. Gill-rakers rather slender, about 10 developed on lower part of anterior arch, besides several rudiments; caudal subtruncate; posterior nostril small; scales not very small (about 110); sides of head and body with rivulations of dark bluish around roundish dark bronze spots, large or small (these markings subject to considerable variation, fading in spirits); sides with darker quadrate areas ..... BONACI, 9.

kk. Gill-rakers very few, short and thick, about 6 developed on lower part of anterior arch, besides about three rudiments; caudal lunate; posterior nostril large; canines strong; scales rather small (about 125); head with very distinct reticulations of darker olive surrounding rather large (yellowish?) spots; body more faintly reticulate ..... RETICULATA, 10.

ee. General color pale, bright red, or grayish, with roundish spots or blotches of black or red darker than the ground color; the blacker blotches along middle of sides much larger and quadrate in the young; red always present somewhere in life (fading in spirits); pectorals blackish, in the adult, broadly tipped with orange yellow; preopercle without salient angle; scales rather small (about 125); caudal lunate; gill-rakers very few and short (about 8 below angle) ..... VENENOSA, 13.

aa. Second dorsal spine highest, its length nearly one-third that of head; caudal slightly lunate; canine teeth feeble; angle of preopercle a little salient; anal fin low; (maxillary scaleless?); color brown, mottled ..... OLFAX, 14.

1. Mycteroperca rosacea.

Epinephelus rosaceus, Streets, Bull. U. S. Nat. Mus., vii, 1877, 51. (Angel Island; Gulf of California.)

Trisotropis rosaceus, Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 107. (Mazatlan.)

Habitat.—Gulf of California.

Head, $2\frac{1}{5}$ ($3\frac{1}{4}$); depth, $2\frac{3}{5}$ ($3\frac{2}{5}$). D. XI, 18; A. III, 11. Scales, 25–*ca* 130–x. Length (28131, Mazatlan), 38 inches.

Body rather elongate, compressed; head large, compressed, pointed anteriorly, the anterior profile nearly straight or slightly convex; snout rather long and sharp, $3\frac{1}{5}$ in head. Mouth large, the maxillary reaching to opposite posterior margin of eye, its length 2 in head. Teeth in moderate bands; canines of moderate size, nearly vertical, the lower

turned somewhat backwards. Eye 7 in head (adult). Interorbital space strongly convex, its breadth about 4 in head. Preopercle with the angle a little salient, the emargination above it rather distinct, the teeth small, those near the angle being somewhat enlarged. Nostrils rounded, very close together, the posterior much the larger. Gill-rakers rather few and long, about 17 on lower part of anterior arch. Scales small, chiefly cycloid.

Dorsal spines rather slender and low, the third $3\frac{2}{5}$ in head. Soft dorsal moderate. Caudal fin distinctly lunate, the upper lobe the longer, $1\frac{3}{4}$ in head. Anal very high and falcate, the middle rays produced in a point, their length $1\frac{9}{10}$ in head, the posterior rays rapidly shortened, so that the outline of the fin is much concave. Anal spines small, graduated. Pectorals reaching beyond tips of ventrals, 2 in head.

Color in life: body and fins nearly uniform brick red. Tip of pectorals dusky; vertical fins without distinct dusky edgings. In spirits, fading first to lemon color, then to dull gray. But two specimens, both adult, of this beautifully-colored species are known. The first was secured by Dr. Streets at Angel Island; the second, from which the above description was taken, was obtained by Dr. J. W. Bastow at Mazatlan, and by him presented to the National Museum.

The fish is very rare at Mazatlan. It was unknown to the fishermen.

2. Mycteroperca falcata. *Abadejo; Bacalao; Scamp.*

a. Var. *falcata.*

Serranus falcatus, Poey, Memorias de Cuba, ii, 138, 1860 (Havana).

Trisotropis falcatus, Poey, Synopsis Pisc. Cubens., 285, 1868 (Havana); Poey, Ann. Lyc. Nat. Hist. N. Y., 309, 1869 (Havana); Poey, Enum. Pisc. Cubens., 15, 1875 (Havana).

Serranus undulosus, Steindachner, Ichthy. Beiträge, xii, 3, 1882 (Rio Janeiro and Messina; *in part;* specimens with angulated anal, supposed to be males).

b. Var. *phenax* (var. nov.).

Trisotropis falcatus, Goode & Bean, Proc. U. S. Nat. Mus., 140, 1879 (Pensacola, Fla.); Poey, Bull. U. S. Fish Comm., ii, 118, 1882 (Key West, Fla.); Jordan & Gilbert, Proc. U. S. Nat. Mus., 273, 1882 (Pensacola, Fla.); Jordan & Gilbert, Synopsis Fishes North America, 538, 1883 (copied from Goode & Bean).

Epinephelus falcatus, Jordan, Proc. U. S. Nat. Mus., 1884, 124 (Key West).

Habitat—Var. *falcata*, Cuba to ? Brazil, ? Messina; var. *phenax*, coast of Florida, Pensacola, Key West.

Var. *falcata.*

DESCRIPTION OF SPECIMENS FROM HAVANA.

Head, $2\frac{7}{8}$ ($3\frac{2}{5}$); depth, $3\frac{1}{8}$ ($4\frac{1}{6}$). D. XI, 17; A. III, 11. Scales, 25–140 + x. Length, $14\frac{1}{2}$ inches.

Body moderately elongate, compressed, its greatest width $2\frac{2}{5}$ in its depth, head compressed, rather pointed anteriorly, the anterior profile

nearly straight. Mouth rather large, the maxillary reaching posterior border of eye, $2\frac{1}{3}$ in head; teeth in rather narrow bands; each jaw with two strong canines, rather larger than in any related species, those of the upper jaw directed very strongly forwards and slightly downwards; those of the lower jaw a little smaller, and directed similarly upwards and backwards. Eye larger than in var. *phenax*, 5 in head (adult). Interorbital space slightly convex, 5 in head. Nostrils close together, the posterior the larger. Upper limb of preopercle slightly convex, very finely serrate; a rather sharp notch above the angle, which is salient, and bears a few coarse teeth. Gill-rakers rather few, 19 or 20 on lower part of anterior arch. Scales small, mostly cycloid. Dorsal spines rather slender and weak, the outline of the fin gently curved, the second spine about equal to the eighth and higher than the tenth; the third and fourth spines longest, $2\frac{1}{3}$ in head: caudal and anal fins formed as in var. *phenax;* longest ray of anal, $2\frac{1}{4}$ in head; upper lobe of caudal, $1\frac{1}{3}$. Pectoral reaching tips of ventrals, $1\frac{1}{3}$ in head. Pyloric cœca 15 (Poey).

Color in life brown above; sides grayish brown, faintly covered with darker spots which disappear in spirits. Eyes and angle of mouth yellowish. Vertical fins dusky, the outer portions bluish black; ventrals and pectorals bluish black, the pectorals with a whitish edge.

Var. *phenax* (var. nov.).

Specimens from the Florida coast differ somewhat from all those observed at Havana, and we have thought best to designate them by a distinct name. The chief difference is in the direction of the canine teeth, which are rather weaker than in var. *falcata*, those of the upper jaw scarcely directed forward, those of the lower scarcely backward. The serræ on the preopercle are rather weaker than in var. *falcata*, and there is some difference in color, as is shown in the following notes on a specimen from Key West.

Head 3 ($3\frac{7}{8}$); depth, $3\frac{2}{5}$ ($4\frac{2}{5}$). D. XI, 18; A. III, 11. Scales, 24–135+ x. Length, 13 inches.

Color in life pinkish gray above, paler purplish gray below; upper parts and opercle thickly covered with small, rounded, irregular spots of dark brown. Sides with larger and fainter brown blotches, more or less horizontally oblong, and somewhat recticulate. Spinous dorsal brownish; soft dorsal darker, faintly spotted, edged with dusky and with a narrow rim of whitish anteriorly. Caudal, brownish, spotted with darker, its outer rays blackish posteriorly; anal dusky, blackish anteriorly, and edged with whitish. Pectorals plain, dusky toward the tips, edged with whitish. Ventrals pale, tipped with dusky; mouth pale, scarcely greenish.

This species reaches a smaller size than most others of this subgenus, the largest seen not weighing more than six or eight pounds. It is one of those most valued as food. The variety *falcata* is rather common

in the markets of Havana, where it is known as *Abadejo* or *Bacalao*, both words meaning cod. The variety *phenax* is abundant about the Florida Keys, being brought in every day to the markets of Key West. It is also often taken with the hook and line on the Snapper Banks at Pensacola. It is known everywhere on the Florida coast as "Scamp."

Little is known of the southward range of this species.

3. Mycteroperca tigris. *Bonací Gato.*

a. Var. *tigris* (brown variety).

Serranus tigris, Cuv. & Val., ix, 440, 1833 (San Domingo); Günther, i, 112, 1859 (copied).
Trisotropis tigris, Poey, Ann. Lyc. Nat. Hist. N. Y., 1869, 307 (Havana); Poey, Enum. Pisc. Cubens., 1875, 14.
Serranus felinus, Poey, Memorias Cuba, ii, 134, 1860 (Havana).
Serranus repandus, Poey, Mem. Cuba, ii, 135, 1860 (Havana).

b. Var. *camelopardalis* (red variety).

Serranus camelopardalis, Poey, Mem. Cuba, ii, 132, 1860 (Havana).
Trisotropis camelopardalis, Poey, Syn. Pisc. Cub., 283, 1868; Poey, Ann. Lyc. Nat. Hist. N. Y., 307, 1869; Poey, Enum. Pisc. Cub., 1875, 14.
Serranus rivulatus, Poey, Memorias Cuba, ii, 1860, 135 (Havana).

Habitat.—Cuba; San Domingo.

DESCRIPTION OF VAR. TIGRIS.

Head, $2\frac{3}{4}$ ($3\frac{1}{2}$); depth, $3\frac{1}{2}$ ($4\frac{1}{3}$). D. XI, 16; A. III, 11. Scales, 22–133–x. Length, 12 inches.

Body rather robust, somewhat compressed; its greatest width half its greatest depth; head moderately pointed, its anterior profile gently curved; mouth moderate, the maxillary extending slightly beyond eye, $2\frac{1}{3}$ in head; teeth in very narrow bands, the lateral teeth larger than in related species; each jaw with two strong canines in front, not directed forward; eye small, 7 in head; interorbital space convex, 6 in head; posterior nostril much larger than anterior, not twice its own diameter from eye; preopercle with a very slight notch, the angle not at all salient, but with slightly enlarged teeth.

Scales small, mostly ctenoid; dorsal spines rather slender, the second slightly longer than tenth, the third and fourth highest, $3\frac{1}{3}$ in head; caudal concave, the inner rays $1\frac{1}{6}$ in outer, which are $1\frac{2}{3}$ in head; anal with its posterior margin subtruncate, the longest rays $2\frac{1}{2}$ in head; pectorals reaching beyond tips of ventral, 2 in head. Pyloric cœca 15 (Poey). Color in life, olive brown, with about five pale grayish cross-bands, narrower than the interspaces, these bands almost obsolete in spirits. All the fins bluish black, the vertical fins edged with whitish, and the pectorals tipped with orange. Top of head reddish, becoming dusky in spirits.

According to Poey, his *Trisotropis camelopardalis* differs from *tigris* only in its redness of color. The case is apparently parallel with that

of the different varieties of *M. venenosa*, *Enneacentrus fulvus*, and *E. guttatus*.

The color of *camelopardalis* is thus described by Poey: "All the body, except the head above and below and the lips, is covered by round spots of the diameter of a pea, a diameter apart, closer together on the head, of a reddish brown, therefore scarcely distinguishable on the back from the ground color; they are redder on the head; the dorsal is reddish, with a violet border; the anal dark violet, with two interrupted bands of clear violet; pectorals of a dirty vermilion; ventrals bluish black, paler behind; caudal dusky bluish, with many elongate violet spots between the rays; vertical fins and ventrals with a whitish border; iris vermilion, inside of mouth red."

A single specimen of the brown form of this species was seen at Havana, where it is known as "Bonací Gato."

4. Mycteroperca interstitialis.

Serranus interstitialis, Poey, Memorias ii, 127, 1860 (Cuba).

Trisotropis interstitialis, Poey, Synopsis Pisc. Cubens., 1868, 285; Poey, Ann. Lyc. Nat. Hist. N. Y., 308, 1869; Poey, Enum. Pisc. Cubens., 14, 1875.

? *Trisotropis chlorostomus*, Poey, Repertorio, ii, 231, 1868; Poey, Synopsis Pisc. Cubens., 285, 1868; Poey, Ann. Lyc. Nat. Hist. N. Y., 308, 1869 (Cuba).

Habitat.—Coast of Cuba.

Head, $2\frac{2}{3}$ ($3\frac{2}{5}$); depth, $3\frac{1}{2}$ ($4\frac{2}{7}$). D. XI, 16–17; A. III, 12. Scales, 23–120–x. Length, $11\frac{1}{2}$ inches.

Body more slender than in any other of the species here described; its greatest width half its greatest depth; head not very acute, the anterior profile rather strongly curved, somewhat gibbous above the eyes; mouth moderate, the maxillary reaching slightly beyond eye, $2\frac{1}{4}$ in head; teeth in narrow bands; two strong canines in the front of each jaw, those of the upper jaw nearly vertical; nostrils rather small, subequal, nearly round; interorbital space slightly concave, its width $5\frac{1}{2}$ in head; the orbital ridges elevated; eye large, $5\frac{1}{2}$ in head. Preopercle with a moderate emargination, its angle a little salient, with slightly coarser teeth; gill-rakers rather few, about 17 on lower part of anterior arch.

Scales rather small, chiefly cycloid.

Dorsal spines rather slender and weak, the outline of the fin gently convex; the second spine slightly longer than the tenth, the third and fourth longest, $3\frac{1}{3}$ in head; anal rather high, posteriorly rounded, 2 in head; caudal fin a little concave, the inner rays $1\frac{1}{3}$ in outer, which are $1\frac{2}{3}$ in head; pectorals reaching tips of ventrals, 2 in head. Pyloric cœca, 12 (Poey).

Color of body in spirits dark brown, in life with small darker spots surrounded by reticulations of the ground color. Dorsal and caudal fins dusky, their margins blackish; anal dusky, edged with bluish black; ventrals dusky, edged with bluish black, its rays lighter; pectorals dusky, a well-defined moustache above the maxillary.

Fins edged with dull orange in life, this color disappearing in spirits.

This species is rather common in the markets of Havana, where several specimens were obtained, none of them very large.

This is probably the species to which Professor Poey has given the name of *interstitialis*, although our specimens do not altogether agree with his descriptions.

We have ventured to refer Poey's *chlorostomus* to the synonymy of *interstitialis*, the principal distinctive character given ("spots rounded, smaller, and wider apart") being one of little importance.

Nothing is known of the distribution of this species outside of the waters of Cuba.

5. Mycteroperca calliura.

Mycteroperca calliura, Poey, Repertorio, 1867, i, 181, 309 (Cuba).
Hist. N. Y., ix, 307, 1869; Poey, Enum. Pisc. Cubens., 14, 1875.
Trisotropis calliurus, Poey, Syn. Pis. Cubens., 284, 1868; Poey, Ann. Lyc. Nat.

Habitat.—Cuba.

This species is known to us only from the accounts of Professor Poey. The original type is a stuffed skin of a young specimen now preserved in the University of Havana.

If Poey's description is correct, the species would appear to be well distinguished from its relatives, although it resembles *microlepis* and *interstitialis*.

The following is the substance of the original description of this species:

Individual described 500 millimeters long. The height is contained $3\frac{4}{5}$ times in the total length from tip of mandible to tips of caudal; the head measured in the same way to the membranous tip of the opercle enters $3\frac{2}{5}$ times in the same length. The eye is moderately high, its diameter 6 in head from tip of upper jaw, or $1\frac{2}{3}$ in length of snout. At a distance of $\frac{2}{5}$ of a diameter from the eye the nostrils are placed. These form a broad aperture divided by a vertical membrane, the anterior part smaller, communicating with the posterior, which contains the two olfactory openings, one above the other; the upper in a concavity, the lower in a prominence.

The maxillary extends to the vertical from the middle of the eye; measured with the compass it reaches the posterior part of the orbit; the lower jaw projects much beyond the upper. The outer teeth are conic, well separated, with one or two canines in front on each side, moderately large: below a small canine on each side; within are the smaller teeth arranged as usual in this genus.

The preopercle has the ascending branch curved, very finely denticulated, forming a re-entrant angle before coming outward in a pronounced salient angle with strong denticulations. The opercle has the median spine large, the others very small.

D. XI, 17; A. III, 11; P. 17. Scales, 25–130–40 to 50.

The dorsal is lower than the anal; the 5th and 6th rays from the last are the highest. The first dorsal spine is nearly half the second, which

is nearly equal to the third. The caudal is truncate with two prolonged points. The other rays each end in a point, there being a deep notch of the membrane between each one and its neighbor.

Scales small, ciliated, covering most of the head, as usual.

Color, dark brownish olive with rounded spots of yellowish, obscure in some specimens; lips yellowish; iris olive; fins dark brown, darker on the edges of the vertical fins, with a pale edge along the soft dorsal and anal. The caudal has a beautiful green cross-band, preceding the denticulations of its extremity. The pectoral towards the center is yellowish, followed by a dark color coming from the coloration of the rays; all the posterior margin is green.

Pyloric cœca 12, large and firm.

Later, Poey describes the color as clear yellowish brown, with brown spots. A living specimen showed eight narrow dusky cross-bands, which disappeared after death.

D. XI, 17; A. III, 12. Third soft ray of the anal more prolonged.

6. Mycteroperca dimidiata.

Serranus dimidiatus, Poey, Memorias Cuba, 1860, ii, 129 (Cuba).

Trisotropis dimidiatus, Poey, Syn. Pisc. Cubens., 1868, 285; Poey, Ann. Lyc. Nat. Hist. N. Y., 1869, 308; Poey, Enum. Pisc. Cubens., 1875, 14.

Habitat.—Cuba.

This species is known only from Poey's accounts. The coloration as given by Poey is unlike that of any other species known to us. We therefore admit it as distinct, but regard it as a doubtful species.

7. Epinephelus microlepis. *Gag; Aguaji.*

Serranus acutirostris, Cuvier & Valenciennes, Hist. Nat. Poiss., ix, 432 (Charleston: no descr.; not type); Dekay, New York Fauna, Fishes, 1842, 23 (Charleston).

Trisotropis acutirostris, Gill. Rept. U. S. Fish. Comm., 1871–72, 806. (Name only.)

Trisotropis brunneus, Goode & Bean, Proc. U. S. Nat. Mus., 1879, 115, 143. (Pensacola; not of Poey.)

Trisotropis microlepis, Goode & Bean, Proc. U. S. Nat. Mus., 1879, 141 (West Florida); Goode & Bean, Proc. U. S. Nat. Mus., 1882, 238 (no descr.); Jordan & Gilbert, Syn. Fish. N. A., 1883, 538 (copied).

Epinephelus microlepis, Jordan, Proc. U. S. Nat. Mus., 1884, 124. (Key West; Cedar Keys.)

Trisotropis stomias, Goode & Bean, MSS.; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 273 (Pensacola); Goode & Bean, Proc. U. S. Nat. Mus., 1882, 427 (Pensacola; Key West); Jordan & Gilbert, Syn. Fish. N. A., 918, 971; Bean, Cat. Fishes Exhib. London, 1883, 61 (Pensacola).

Head, $2\frac{2}{3}$ ($3\frac{2}{5}$); depth, $3\frac{1}{2}$ ($4\frac{2}{5}$). D. XI, 17; A. III, 11. Scales, 26–145–x. Length, $11\frac{1}{2}$ inches.

Body comparatively elongate, compressed, its greatest width $2\frac{1}{4}$ in greatest depth. Head long, rather pointed, compressed, its anterior profile comparatively evenly curved and not much arched; mouth comparatively large, the maxillary extending (in the young a foot long) slightly beyond the eye, its length $2\frac{1}{3}$ in head. In the adult the max-

illary is proportionately longer, about half head; teeth in rather narrow bands, each jaw with two canines, the upper rather large and directed little forward, the lower rather small. Eye moderate, $6\frac{1}{2}$ in head (young). Interorbital space slightly convex, 7 in head. Gill-rakers few, about 12 on lower part of anterior arch. Preopercle with a shallow emargination above the angle, which is somewhat salient and armed with radiating serræ considerably larger than those on the upper limb, which are very fine. Nostrils small, rounded, subequal, not very close together.

Scales very small, chiefly cycloid.

Dorsal spines comparatively slender and weak, the outline of the fin gently convex; the tenth spine is about as long as second; third and fourth spines longest, $3\frac{1}{2}$ in head. Caudal distinctly lunate, the outer rays one-fifth longer than the inner, $1\frac{3}{4}$ in head. Anal rather high, its posterior margin convex, the longest ray $2\frac{1}{3}$ in head, the spines small, graduated. Pectoral reaching slightly beyond tips of ventrals, 2 in head.

The shade of color of this species is variable, those found in shallow water being lighter and more variegated.

Specimens from deep water are plain brownish gray, paler below, with no distinct spots or rivulations, but faint traces of darker spotting, which disappear in spirits. A faint moustache. Lips not green. Dorsal dark olive, the tip of soft part blue-black, its edge narrowly white. Caudal black, with bright blue shadings, its edge white. Anal deep indigo blue, olive at base, its edge white. Pectorals olive, dusky toward the tip. Ventrals blackish, its first ray tipped with white.

Specimens of the same size as the above, taken in shallow water among grass, are green-olive, mottled with darker green, and variously clouded, but without spots or rivulations. Moustache black. Fins colored as above, distinctly bluish. Radiating streaks of bluish from eye; all the blue markings of life fade, more or less, into dusky or grayish in spirits.

This species ranges farther north on our coasts than any other, except *Epinephelus morio*. It reaches a weight of about fifty pounds. Around the coast of Florida it is generally abundant on the banks and reefs and is an important food-fish. It is known to the fishermen of Florida as the "Gag," and occasionally as "Black" Grouper, but the latter name is usually confined to *M. bonaci* or *E. nigritus*. This species is sent in considerable numbers from Key West to the markets of Havana, where it is known as *Aguaji*. It does not appear to have been mentioned by Poey, although he could not have failed to observe it. All of the specimens seen by Professor Jordan in the markets of Havana came from Key West. We do not know, therefore, that the species occurs in the West Indies. There is no doubt of the identity of *microlepis* and *stomias*, the former based on young specimens in poor condition, the latter on adults well preserved.

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8. **Mycteroperca scirenga.** *Abadejo; Scirenga.*

Sparus scirenga, Rafinesque, Caratteri di Alcuni Nuovi Generi, etc., 1810, 50 (Palermo).

Serranus acutirostris, Cuv. & Val., ii, 286, 1828 (Brazil); Valenciennes, "Ichthyologie des Iles Canaries, pl. III, f. 1" (Canary Islands; Messina); Guichenot, Explor. Sci. Algérie, Zool., v, 35, 1850 (Algiers); Günther, i, 135, 1859; Steindachner, Ichth. Beitr., xii, 5, 1882 (identified with *S. undulosus*).

Cerna acutirostris, Doderlein, Rivista del Genere Epinephelus o Cerna, 1883, 59 (Palermo; description and full synonymy).

Serranus undulosus, Cuv. & Val., ii, 295, 1828 (Brazil); Steindachner, Ichth. Beitr., v, 127, 1876 (Rio Janeiro); Günther, i, 143, 1859 (said to have "pectorals yellow"); Steindachner, Ichth. Beitr., xii, 1882, 3 (Brazil; Port Said; Beiruth; Messina).

Trisotropis undulosus, Poey, Ann. Lyc. Nat. Hist. N. Y., 1869, 305 (after one of the original types).

Serranus fuscus, Lowe, "Trans. Cambr. Philos. Soc., vi, 196, 1836" (Madeira); Günther, i, 1859, 134 (Madeira; Canary Islands); Steindachner, Ichthyol. Bericht., iv, 1867, 14, taf. 2 (Cadiz; Teneriffe).

Serranus emarginatus, Valenciennes, "Ichthyol. Iles Canaries, 10, 1835 to '50" (Canary Is.).

Serranus tinca, Cantraine, "Nouv. Mém. Acad. Brux. 1831, xi."

Cerna macrogenis, Sassi, "Descr. Genova e il Genovasato, i, 139," 1846.

Epinephelus chalinius, Cope, Trans. Am. Philos. Soc., 1871, 465 (St. Martin's.)

Habitat.—West Indies; Brazil; islands of the Eastern Atlantic; Mediterranean.

We have not had the material for a full study of this species, and we have relied chiefly on the accounts of it given by Dr. Steindachner, in the arrangement of its synonymy. Our diagnosis is drawn from the figure of "*Serranus fuscus*" given by Steindachner in his Ichthyologische Berichte. The names *undulosus*, *fuscus*, *emarginatus*, *tinca*, and *macrogenis* are considered by Steindachner to be synonymous with *acutirostris*. We have ventured with a little doubt to add *chalinius* of Cope. The type of this species, examined by us, is very immature, only four inches in length. It has the coloration of *M. scirenga*, the caudal truncate, about 90 scales in the lateral line, a salient angle to the preopercle, and the anal rays III, 10. There is little doubt that it is this species rather than *M. bonaci*.

Dr. Bean informs us that specimens of this species in the British Museum have about twice as many gill-rakers (30 on lower part of anterior arch), as are found in any of the other species of *Mycteroperca* which we have examined.

Since the above was written we have received from our friend Dr. H. E. Sauvage, of the Muséum d'Histoire Naturelle at Paris, the following account of the original types of *Serranus acutirostris* and *Serranus undulosus*, which tends to confirm the identification of these species made by Dr. Steindachner.

We translate from the letter of Dr. Sauvage:

"The type of *Serranus acutirostris* C. V. which is now before me comes from Brazil, by Delalande. It is m. 0.360 in length.

"D. XI, 16; A. III, 11. L. lat. 95.

"Height of the body contained 4 times; length of head $3\frac{1}{2}$ in the total length. Caudal scarcely emarginate. Third anal spine longer and a little stronger than second. Lower jaw longer than upper; maxillary reaching to opposite posterior margin of eye. Muzzle $1\frac{2}{3}$ times length of eye, the diameter of which is $5\frac{2}{3}$ times in the length of the head. Preopercle finely denticulate, the teeth at the angle stronger. Color uniform reddish brown."

A drawing accompanying this shows the maxillary to be half the length of the head, and the angle of the preopercle somewhat salient.

"*Serranus undulosus* is so near to the other species that, except for the presence of undulating lines, I cannot distinguish the two. The caudal is, however, a little more convex."

This specimen is doubtless the young of the one called *acutirostris*.

Professor Doderlein, in his recent "Rivista del genere *Epinephelus*," calls attention to the probable identity of *Sparus scirenga* with *Serranus acutirostris*. Rafinesque's description is of little value, but he says that his species is the fish called "*Scirenga*" at Palermo. According to Doderlein, the "*Scirenga*" of the Palermo market is the *M. acutirostris*. There seems, then, to be no doubt as to the species which Rafinesque had in mind. It appears therefore necessary to substitute *scirenga* for *acutirostris*.

9. Mycteroperca bonaci. *Bonaci arara; Black Grouper.*

Bonaci arara, Parra, Peces y Crustaceos de Cuba, 1787, tab. 16, f. 2 (Havana).
Serranus bonaci, Poey, Memorias de Cuba, 1860, ii, 129 (Cuba).
Trisotropis bonaci, Poey, Syn. Pisc. Cubens., 1868, 283; Poey, Ann. Lyc. Nat. Hist. N. Y., 306, 1869; Poey, Enum. Pisc. Cubens., 1875, 13.
Epinephelus bonaci, Jordan, Proc. U. S. Nat. Mus., 1884, 124 (Key West).
Serranus brunneus, Poey, Mem. Cuba, 1860, ii, 131; Poey, Repertorio Fis.-Nat., ii, 156, 1868.
Trisotropis brunneus, Poey, Syn. Pisc. Cub., 1868, 284; Poey, Ann. Lyc. Nat. Hist. N. Y., 305, 1869; Poey, Enum. Pisc. Cubens., 1875, 13; Poey, Bull. U. S. Fish Comm., 118, 1882 (Key West); Jordan & Gilbert, Syn. Fish. N. A., 1883, 538 (copied).
Serranus arará, Poey, Memorias Cuba, ii, 1860, 132 (Cuba; not of Cuv. & Val.); Steindachner, Ichthyol. Notizen, 1867, vi, 42.
Serranus decimalis, Poey, Memorias Cuba, ii, 1860, 138 (Cuba).
Serranus cyclopomatus, Poey, Mem. Cuba, ii, 1860, 353 (Cuba).
Serranus latepictus, Poey, Mem. Cuba, ii, 1860, 353 (Cuba).
Trisotropis aguaji, Poey, Repertorio, ii, 229, 1868; Poey, Synopsis, 1868, 284; Poey, Ann. Lyc. Nat. Hist. N.Y., ix, 306; Poey, Enumeratio, 14.

Habitat.—West Indies, north to Key West.

Head, $2\frac{3}{4}$ ($3\frac{2}{5}$); depth, $3\frac{1}{4}$ (4). D. XI, 17; A. III, 12. Scales, 22–110–x. Length, $11\frac{1}{2}$ inches.

Body comparatively slender, a little more robust than in *M. microlepis*, its breadth $2\frac{1}{3}$ in its depth; head moderate, rather pointed, its an-

terior profile little curved; mouth rather large, the maxillary reaching slightly beyond eye, $2\frac{1}{3}$ in head (in young), proportionately longer in adult. Teeth in rather narrow bands; two rather strong canines directed little forward in front of each jaw; eye moderate, 6 in head (young). Interorbital space slightly convex, its width 6 in head. Preopercle forming a regular curve without salient angle, the emargination near the angle very slight. Nostrils small, roundish, subequal; not very close together. Gill-rakers few, about 13 on lower part of anterior arch.

Scales rather small, chiefly cycloid; dorsal spines comparatively slender and weak, the outline of the fin gently convex; the tenth spine about as long as second; third and fourth spines longest, $3\frac{1}{3}$ in head; caudal fin truncate when spread open, its outer rays a very little produced, $1\frac{2}{3}$ in head; anal rather high and rounded, its longest rays $2\frac{1}{4}$ in head; pectoral reaching slightly beyond tips of ventrals, $1\frac{7}{10}$ in head. Pyloric cœca 15 (Poey).

Color in life, deep orange-brown, more olive on the back, clouded above by paler or grayish; sides and belly marked everywhere by reticulations of pearly gray, which surround roundish or oblong spots of the ground color, the pale streaks being largely horizontal on the sides. Sides of the head similarly marked, the spots smaller, bronze-brown, the reticulations decidedly bluish. Six or seven spots in a straight line between eye and preopercle, the spots having nearly the diameter of the pupil. Spots on the body mostly covering 4 to 6 scales, all of them larger than a scale. Dorsal olive-brown, somewhat mottled. Caudal similar to dorsal, narrowly edged with whitish; anal similar, with two or three rows of bluish spots, its tips blackish with a narrow whitish edge. Pectorals olive-brown, plain. Ventrals blackish, the rays bluish. Mouth not green, the lips olive, barred with bluish. Iris reddish.

A large specimen, about $2\frac{1}{2}$ feet in length, seen at Key West, retained the same general coloration, the bronze spots and rivulations being distinct and not smaller than in the young. In spirits the orange-brown of the body is replaced by dark brown, and the blue reticulations of the head, by gray; all the markings become more faint. Pyloric cœca 17 (Poey).

The above description is from partly grown specimens. A very large Grouper, lately obtained by Mr. Silas Stearns, at Havana, appears to belong to the same species, although the coloration is strikingly different through the much smaller size of the spots. The following is a detailed description of the Pensacola specimen, of which the skin is preserved in spirits. We regard it, for the present, as a subspecies of *E. bonaci*.

DESCRIPTION OF VAR. XANTHOSTICTA (VAR NOV.).

Head, 3 ($3\frac{1}{3}$); depth, 3 ($3\frac{1}{3}$). D. XI, 17; A. III, 12. Scales, 22–110–x. Length, 46 inches.

Body comparatively robust, formed much as in *E. venenosus*. Head large, its anterior profile little curved, the snout not very acute, $3\frac{2}{3}$ in

head. Mouth large, the maxillary reaching to beyond eye, $1\frac{9}{10}$ in head (in adult). Teeth in moderate bands; two strong, nearly vertical canines in front of each jaw. Eye $9\frac{1}{3}$ in head (adult).

Interorbital space strongly convex, its breadth $4\frac{1}{2}$ in head. Preopercle forming a regular curve, without salient angle, the emargination near its angle very slight. Nostrils roundish, close together, subequal.

Scales rather small, chiefly cycloid. Dorsal spines rather slender and low, the third spine $3\frac{2}{3}$ in head. Caudal fin subtruncate when spread open, its outer rays very slightly produced, $1\frac{7}{8}$ in head; the rays of the fin projecting slightly beyond the membranes. Anal high and rounded, its longest rays $2\frac{4}{5}$ in head. Pectoral reaching slightly beyond tips of ventrals, $2\frac{2}{7}$ in head.

Color of fresh specimen, rather bright dark-purplish gray, scarcely paler below, rather darkest along top of head and sides of back. Chin dark. A few obscure paler rivulations on belly, sides, and especially on breast. Head and body everywhere covered very evenly with round, close-set spots of a bright bronze orange. These spots are mostly broader than the interspaces, and have an average diameter about equal to that of a nostril. These are obscure on lower part of head and body, but there are traces of such spots almost everywhere. The spots are most distinct on head, and they cover the dark part of the eye. On the lower jaw the spots are oblong and more closely set. About 23 spots in a straight line from eye to angle of preopercle. Spots on the body are usually arranged one to each scale, the average diameter being considerably less than that of a scale. None of them on the body are as large as the scale. The bases of the pectoral, anal, and caudal are similarly spotted. Dorsal dark olive-brown, the distal half of the soft dorsal black. Caudal and anal colored like the soft dorsal, the black on the caudal paler, the latter without the narrow pale edge of the dorsal and anal. Pectorals and ventrals brownish, blackish towards the tips, the pectoral with a grayish edge and no yellow. A dusky moustache on preorbital, along edge of maxillary; membrane of region concealed by maxillary covered with very bright orange spots. Angle of mouth on lower jaw largely yellowish-green, with some dull orange.

Mycteroperca bonaci is abundant about Key West, where it is known as Black Grouper, being the only species to which that name is applied. It reaches a weight of 50 pounds. The young are taken along the shore in the seine. The species is about equally common at Havana, where it is known as *Bonaci ararά*.

Poey has already recognized his *ararά*, *decimalis*, *cyclopomatus*, and *latepictus* as synonyms of his *brunneus*. But we see nothing of any importance to distinguish his *bonaci* from *brunneus*, and adopt the former name as the oldest for the species, which, notwithstanding its abundance, does not seem to have been named by earlier authors. Poey's *Trisotropis aguaji*, distinguished only by the olivaceous yellow color of the base of the soft dorsal, is almost certainly the same. If our identification

of the large specimen from Pensacola is correct, very old specimens may exhibit material differences in coloration, due to the subdivision of the bronze spots and the disappearance of the rivulations. Similar changes certainly do take place in *M. venenosa*. It is more likely, however, that the *xanthosticta*, like the *cardinalis*, *camelopardalis*, &c., is a varietal form, inhabiting deeper water.

10. Mycteroperca reticulata.

Trisotropis reticulatus, Gill, Proc. Ac. Nat. Sci. Phila., 1865, 105 (Barbadoes).

Habitat.—Barbadoes; one specimen known.

Head, $2\frac{4}{5}$ ($3\frac{1}{5}$); depth, $3\frac{2}{3}$ ($4\frac{1}{3}$). D. XI, 17; A. III, 11. Scales, 18–123–x. Length (6708, Barbadoes), 19 inches.

Body moderately elongate, rather strongly compressed. Head large, the anterior profile rather more strongly curved than in most species, somewhat gibbous above the eyes; snout not very acute, $3\frac{4}{5}$ in head. Mouth very large, oblique, the maxillary extending to beyond the eyes; its length $2\frac{1}{5}$ in head. Canines moderate, nearly vertical. Lower jaw strongly projecting; eye $6\frac{2}{3}$ in head. Posterior nostril much larger than anterior; the two close together and close to eye. Interorbital space strongly convex; its breadth $5\frac{2}{3}$ in head. Preopercle forming a regular curve, without salient angle or conspicious emargination. Gill-rakers very short and broad; about 6 developed on lower half of arch, besides about 3 rudiments.

Scales rather small, chiefly cycloid. Dorsal spines rather slender, the second, third, and fourth subequal, $3\frac{1}{2}$ in head. Soft dorsal slightly angulated, the tenth ray slightly longer than the others, 3 in head. Caudal somewhat lunate, the outer rays $1\frac{9}{10}$ in head. Anal high, slightly angulated, the largest rays $2\frac{2}{3}$ in head. Anal spines short, graduated. Pectorals reaching somewhat beyond tips of ventrals, 2 in head.

Color, in spirits, olivaceous; the head covered with very distinct honeycomb-like reticulations of darker olive, surrounding pale spots, from the size of the nostril to that of the pupil; body showing traces of such spots. Fins plain, the soft dorsal and anal edged with blackish.

The above description is taken from the original type of the species collected at Barbadoes by Dr. Gill. No second specimen is yet known. The species appears to be distinct from *M. bonaci* and *M. venenosa*, although certainly very closely related to the latter. Possibly some of Poey's names, referred by us to the synonymy of *bonaci*, may prove to to belong to the present species.

11. Mycteroperca venenosa. *Rock-fish; Yellow-finned Grouper; Bonaci cardenal; Bonaci de Piedra.*

a. Var. *venenosa* (gray variety).

Perca marina venenosa, the Rock-fish, Catesby, Fishes Carolina, &c., tab. 5 (Bahamas).

Perca venenosa, Linnæus, Syst. Nat., x, 292, 1758 (after Catesby); *ibid.*, xii, 486; Gmelin, Syst. Nat., 1788, 1318, (copied); Bloch & Schneider, Syst. Ichth., 1801, 92 (copied).

Epinephelus venenosus, Jordan, Proc. U. S. Nat. Mus., 1884, 124 (Key West).
Serranus petrosus, Poey, Memorias Cuba, ii, 136, 1860 (Havana); Poey, Repertorio, ii, 165, 1868.
Trisotropis petrosus, Poey, Ann. Lyc. Nat. Hist. N. Y., 1869, 304; Poey, Enum. Pisc. Cubens., 1875, 13; Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West); Jordan & Gilbert, Syn. Fish. N. A., 1883, 918 (copied).
Trisotropis undulosus, Goode, Bull. U. S. Nat. Mus., v, 55, 1876 (Bermudas; excl. syn.).

b. Var. *guttata* (*cardinalis*) (red variety).

Bonaci cardenal, Parra, Peces y Crustaceos Cuba, 1787, 29, lam. xvi (Havana).
Johnius guttatus, Bloch & Schneider, Syst. Ichthyol., 1801, 77 (after Parra).
Trisotropis guttatus, Goode, Bull. U. S. Nat. Mus., v, 1876, 56 (Bermudas).
Serranus cardinalis, Cuv. & Val., ii, 1828, 378 (after Parra); Poey, Repertorio, i, 1867, 200.
Trisotropis cardinalis, Poey, Ann. Lyc. Nat. Hist. N. Y., 1869, 303 (Cuba); Poey, Enum. Pisc. Cubens., 1875, 13.
Serranus rupestris, Cuv. & Val., ix, 437, 1833 (San Domingo); Günther, i, 145, 1859 (copied).

Habitat.—West Indies, Florida Keys, Bermudas; the red variety (*guttata=cardinalis*) not yet known from our coasts.

A. DESCRIPTION OF AN ADULT SPECIMEN FROM KEY WEST, VAR. VENENOSUS.

Head, $2\frac{2}{3}$ ($3\frac{1}{2}$); depth, 3 ($3\frac{4}{5}$). D. XI, 16; A. III, 11. Scales, 24–125–x. Length, $20\frac{1}{2}$ inches.

Body rather robust, not strongly compressed; head rather bluntish, its anterior profile a little uneven. Mouth large, the maxillary reaching much beyond eye, 2 in head; teeth in rather narrow bands, each jaw with two strong canines, which are not directed forwards; nostrils moderate, close together, the posterior largest. Eye small, 7 in head (adult). Interorbital space flat, broad, 5 in head. Preopercle without salient angle, its emargination slight.

Scales rather small, chiefly cycloid. Dorsal spines not very weak, the outline of the fin gently convex, the second spine about as long as tenth, the highest 3 in head. Caudal fin lunate, the inner rays $1\frac{1}{3}$ in outer, which are $1\frac{1}{2}$ in head. Anal rounded, rather low, the longest rays $2\frac{1}{2}$ in head. Pectorals reaching well beyond tips of ventrals, 2 in head. Pyloric cœca 15 to 20 (Poey).

Color in life (adult) clear olive green, livid bluish or pearly below, (grayish below in spirits). Upper parts marked everywhere with broad reticulations, and curved blotches of bright clear light green; these reticulations most distinct on the upper part of the head; a greenish blotch on shoulder before dorsal. Entire body and head covered with round orange-brown spots (becoming brown in spirits) about as large as the nostrils, the centers darkest; these spots largest and least numerous above. Angle of mouth orange within. Iris orange. Breast slightly rosy, grayish in spirits. Dorsal olive brown with whitish blotches and a very few dark spots. Soft dorsal, anal, caudal, and ventrals broadly edged with blackish, the caudal with more spots, these fins otherwise

colored like the dorsal fin. Pectoral olivaceous, its tip yellow, its base spotted.

No young specimens of this variety have been examined, but probably the same changes in color will be found that occur in the "Bonaci cardenal."

B. DESCRIPTION OF SPECIMENS FROM HAVANA (VAR. GUTTATA OR CARDINALIS).

Head, $2\frac{2}{3}$ ($3\frac{2}{5}$); depth, 3 ($3\frac{4}{5}$). D. XI, 16; A. III, 11. Scales, 24–121–x.

Body rather short and deep, rather strongly compressed. Head rather bluntish, the anterior profile rather strongly and regularly arched; mouth rather large, the maxillary reaching past the eye; $2\frac{1}{8}$ in head (in young). Lower jaw projecting, but rather less prominent than usual in *Mycteroperca*. Teeth moderate, in rather narrow bands; both jaws with two moderate canines in front, the upper larger and not directed forwards. Nostrils close together, subequal. Eye small, $5\frac{1}{2}$ in head (young). Interorbital space flattish or slightly concave, its width 6 in head. Preopercle without salient angle, its emargination very slight, the teeth below the notch slightly enlarged.

Scales rather small, chiefly cycloid. Dorsal spines not very slender, the second spine as long as tenth; the third and fourth highest, $3\frac{1}{6}$ in head. Caudal fin slightly lunate, the outer rays little longer than inner, $1\frac{2}{3}$ in head. Anal rather high, somewhat rounded, the longest rays $1\frac{5}{6}$ in head. Pectoral about reaching tips of ventrals, $1\frac{3}{4}$ in head.

The color varies much with age and probably also with the depth of water.

a. Color in life of an adult example about $2\frac{1}{2}$ feet in length: Very dark everywhere, sparsely covered with round spots, which are black on the body and red on the belly. Mouth, red within. Pectoral, broadly edged with orange red, otherwise plain. No other bright colors anywhere. Soft parts of vertical fins largely black.

b. Color in life of an example about 2 feet in length: Intense scarlet-red above, grayer below; above, small black spots; below, larger red ones. Base of dorsal and caudal deep red. Edge of dorsal, caudal, and anal, black. Pectoral, spotted at base, then blackish, thence broadly yellow.

c. Color in life of specimens 8 inches in length: Scarlet-brown above, the color varying from vermilion to gray, becoming grayish in spirits; sides light gray; the ground color forming rivulations around quadrate blotches of black. Belly and lower part of head scarlet. Blotches above and on sides, black; the upper ocellated with red; those on sides, below lateral line, presenting the appearance of interrupted horizontal bands; the blotches below all vermilion, separated by rivulations of ground color. Lower jaw yellowish, with red blotches. Pectorals yellow; the fins otherwise all marbled with red and black; the vertical fins with grayish rivulations, edged with black and tipped with white. In spirits the scarlet and red above become gray, the vermilion below,

whitish. With age the large quadrate blotches on the side and below gradually break up into smaller spots, and in time the coloration of *a* and *b* is reached.

This differs from the coloration of the adult of var. *venenosa* chiefly in the shade of the ground color, which is scarlet instead of gray.

We are unable to detect any difference between *M. venenosa* and *M. guttata*, except that of color, the former having no red, except the spots, while the latter has the ground color chiefly red. We believe this difference to be dependent either on the depth of the water or (which seems more likely) the character of the bottom.

The synonymy otherwise needs no special remark, the name *venenosa* having clear priority over all others. If *Mycteroperca* be regarded as a genus distinct from *Epinephelus*, the name *guttata* should supersede *cardinalis* for the red variety.

Two specimens of the gray variety (*venenosa*) were obtained by Professor Jordan at Key West, where the species is known to the fishermen as Rock-fish. It is also rather common at Havana, where it is called *Bonaci de Piedra*. The red variety is a common food-fish at Havana, and is called by the fishermen now, as in the time of Parra, *Bonaci cardenal*.

12. Mycteroperca olfax.

Serranus olfax, Jenyns, Zool. of the Beagle, Fishes, p. 9, pl. 4, 1842 (Galapagos Archipelago); Günther, Cat. Fishes Brit. Mus., i, 153 (copied).
Mycteroperca (*olfax*), Gill, Proc. Ac. Nat. Sci, Phila., 1863, 80 (generic diagnosis).

Habitat.—Galapagos Islands.

This fish is known to us only from the account given by Dr. Jenyns. The peculiar structure of the nostrils, as described by Jenyns, and as used originally to define the genus *Mycteroperca*, is said to be merely a deformity due to the faulty preparation of the stuffed skin of the type. It is probable that the small anterior nostril was overlooked by Jenyns, and the fleshy septum within the large posterior nostril was taken by him for the line of separation between the nostrils. In the form of the spinous dorsal this species diverges from the other members of the genus, much as *Epinephelus morio* does from the other *Epinepheli*, but it seems to be peculiar in no other respect.

The statement of Jenyns that the maxillary is naked is probably incorrect.

II.—Genus PROMICROPS.

PROMICROPS, (Gill MSS.) Poey, Synopsis Piscium Cubensium, 1868, 287 (*guasa=itaiara*).
ITAIARA, Vaillant & Bocourt, Mission Scientifique au Mexique, 1875 (*itaiara*).

This genus is well distinguished by the peculiarities of its cranium, as well as by the structure of its lateral line. One species only is certainly known, a tropical fish of very large size, bearing a strong resemblance to the species of *Stercolepis*.

ANALYSIS OF SPECIES OF PROMICROPS.

a. Color olivaceous with darker cross-shades, which fade with age; head and body with round black spots; preopercle without strong tooth below angle; dorsal spines low, the edge of the spinous dorsal scarcely convex; second anal spine as long as third; profile slightly concave above eye; scales moderate (about 95).

ITAIARA, 13.

13. Promicrops itaiara. *Guasa; Jew-fish; Merou.*

Cugupuguacu, Marcgrave, Hist. Brazil, &c., 1648, 169 (Brazil).

Itaiara, Marcgrave, Hist. Brazil, &c., 1648 (Brazil).

? *Perca guttata*, L., Syst. Nat., 1758, x, 292 (in part: after Marcgrave, &c.).

Serranus itaiara, Lichtenstein, Acta Berolin., 1820–1, 278 (Brazil); Cuvier & Valenciennes, ii, 1828, 376 (Brazil); Peters, Berliner Monatsber., 1865, 110 (Identification with *S. galeus* M. & H.); Steindachner, Ichth. Beitr., v, 127, 1876.

Serranus (*Itaiara*) *itaiara*, Vaillant & Bocourt, Miss. Sci. au Mexique., 1875, 90, pl. ii, f. 4 (identification with *S. quinquefasciatus*. Brazil; Tanesco; Mexico; Pacific).

Epinephelus itaiara, Jordan, Proc. U. S. Nat. Mus., 1884, 124 (Key West).

Serranus galeus, Müller & Troschel, Schomburgk's Reise in Brit. Guiana, 621, about 1842; Günther, i, 1859, 130 (Brazil).

Epinephelus galeus, Jordan, Proc. Ac. Nat. Sci. Phila., 1883, 285 (identification of type of *Serranus galeus*).

Serranus guasa, Poey, Memorias Cuba, ii, 1860, 141, 354, tab. 13, f. 8 (Cuba).

Promicrops guasa, Poey, Rep., ii, 154, 1868; Poey, Synopsis Pisc. Cub., 287, 1868; Poey, Enum. Pisc. Cubens., 1875, 18; Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West); Jordan & Gilbert, Syn. Fishes N. A., 1883, 542 (copied); Gill, Rep. U. S. Fish Comm., 1871–2, 806 (name only).

Epinephelus guasa, Goode & Bean, Proc. U. S. Nat. Mus., 1882, 238 (name only).

Serranus quinquefasciatus, Bocourt, Ann. Sci. Nat., 1868, 223 (Nagualate; Pacific coast of Guatemala).

Epinephelus quinquefasciatus, Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 106, 110, 112 (Mazatlan; Panama; Punta Arenas). No descr.

Habitat.—Both coasts of tropical America north to Florida, and Gulf of California south to Brazil.

Head, $2\frac{3}{5}$ ($3\frac{2}{5}$); depth, $3\frac{1}{10}$ ($3\frac{9}{10}$). D. XI, 16; A. III, 8. Scales, 20–95–x. Length, 16 inches.

Body more robust than in any other of our species, its greatest breadth $1\frac{2}{3}$ in the depth. Head very large, unusually broad, anteriorly obtuse, its profile depressed or slightly concave above the eye, convex at the nape. Snout very short, $4\frac{3}{4}$ in head; lower jaw projecting. Mouth large, the maxillary, even in the young, reaching much beyond the eye, 2 in head. Teeth in broad bands, those of the outer series somewhat enlarged, the canines very small, scarcely differentiated, but present. Eye very small, 7 in head (in young). Interorbital area flattish, very broad, its width 5 in head. Nostrils subequal, roundish, close to the eye. Preopercle convex, with a slight emargination, the angle a little prominent, with somewhat larger teeth. Opercular spines small and blunt. Gill-rakers short and thick, few (about 12) in number.

Scales comparatively large, mostly ctenoid. Scales of the lateral line, each with 4 to 6 conspicuous radiating ridges separated by furrows.

Dorsal spines low and strong, the third, fourth, and fifth subequal, 4 in head, the outline of the [fin] scarcely convex; second spine lower than

tenth; caudal fin rounded, its outer rays very much shortened, little more than half the length of the middle rays, which are 1½ in head. Anal rounded, its longest rays 2⅓ in head. Second anal spine about as long as third and a little stronger, 4⅗ in head. Pectoral reaching a little beyond tips of ventrals, 1⅔ in head. Ventrals 2. Pyloric cœca excessively numerous and finely divided. Color of a young specimen in life pale olive green, slightly yellowish on breast and lower jaw. Body with five cross-bars of dark olive green, with irregular but rather sharply defined edges, and extending on the dorsal and anal fin; two under spinous dorsal, two between soft dorsal and anal, one on caudal peduncle; these bars partially or wholly disappear in spirits. A dark blotch at nape; two shades down and backward from eye. A bar at base of caudal. Round blackish spots smaller than pupil of different sizes scattered over the whole of head and nuchal region; a few along back; these smallest on upper part of head, largest on back and lower parts of sides of head. Breast and belly plain. Dorsal fin olive, with dark clouds like the body, a few spots on spines and tips of soft rays. Caudal much clouded with dark, which forms series of spots on the hinder parts, these spots smallest and best defined posteriorly. Anal similar to caudal. Pectorals light olive, profusely covered with large dark spots. Ventrals similar to pectorals, with fewer spots. Tips of pectorals and caudal slightly reddish. In spirits the dark bands and blotches of body are more or less faded.

A very large specimen of this species, about 5 feet in length, seen by Professor Jordan at Key West, had the same general coloration as the young examples, the bars becoming much fainter and less definite.

This species reaches a larger size than any other of the *Epinepheli*, its weight being probably not less than 600 to 800 pounds. The adult fishes bear a strong resemblance to the gigantic Jew-fish of California (*Stereolepis gigas*), a species which we consider a near ally of *P. itaiara*.

We are not able to distinguish specimens of the Pacific coast form (*quinquefasciatus*) from the Atlantic *itaiara*. The bands in the former seem rather more sharply defined, but no other difference is evident. The types of *quinquefasciatus* have been also compared with the specimens called *itaiara* by Cuvier and Valenciennes, by Vaillant, and the two are regarded by him as identical. The type of Lichtenstein's *Serranus itaiara* has been examined by Peters, and pronounced identical with *Serranus galeus* of Müller and Troschel. Professor Jordan has examined the original types of Poey's *guasa* and Müller and Troschel's *galeus*. There is therefore apparently no room for doubt as to the identity of *itaiara*, *galeus*, and *guasa*.

As to the question of the pertinence to this species of the Linnæan name *Perca guttata*, see the discussion under the head of *Enneacentrus guttatus*.

The peculiarities in the scales of this species have led Vaillant and Bocourt to regard it as the type of a distinct subgenus, which they have called *Itaiara*.

The differences in the form of the head have led Gill and Poey also to make it the type of a generic division, which they have named *Promicrops*. The species should undoubtedly be considered as forming a distinct group, for which the name *Promicrops* must be retained.

This fish is known in Florida and in the West Indies as Jew-fish to English-speaking fishermen, and as *Guasa* to those that speak Spanish.

III.—Genus EPINEPHELUS.

EPINEPHELUS, Bloch, Ichthyologia, 1793 (*ruber, afer,* &c.).
CEPHALOPHOLIS, Bloch & Schneider, Syst. Ichthyol., 1801, 311 (*argus*).
CYNICHTHYS, Swainson, Nat. Hist. Classn. Fishes, ii, 1839, 201 (*flavo-purpuratus*).
CROMILEPTES, Swainson, Nat. Hist. Classn. Fishes, ii, 1839, 201 (*gigas,* &c.).
CERNA, Bonaparte, Introduzione Iconogr. Fauna Italica, 1841 (*gigas*).
HYPORTHODUS, Gill, Proc. Ac. Nat. Sci. Phila., 1861, 237 (*flavicauda*=*niveatus*).
SCHISTORUS, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 237 (*mystacinus*).
LABROPERCA, Gill, Proc. Ac. Nat. Sci. Phila., 1863, 80 (*labriformis*).
MERUS, Poey, Ann. Lyc. Nat. Hist. N. Y., about 1869 (*gigas,* &c.).
PRIACANTHICHTHYS, Day, Proc. Zool. Soc. London, 1868 (young).
CERNA, Doderlein, Rivista delle Specie del genere *Epinephelus* o *Cerna*, 1873 (*gigas*).
SERRANUS sp., auct. (*nec typus*).

This group is richer in species and more widely distributed over the earth than any of the others. It is also undoubtedly more diverse in its composition. We do not, however, think that any further subdivision among the American species is desirable. The species most aberrant are *E. morio*, with lunate caudal and emarginate dorsal; *E. mystacinus*, with plectroid armature to the preopercle and other peculiarities, and *E. analogus*, with ten dorsal spines only. *E. niveatus* and *E. mystacinus* also differ from most of the others in having an increased number of pyloric cœca. Possibly the latter species should be placed in or near *Alphestes*, but it more resembles *Epinephelus*.

ANALYSIS OF SPECIES OF EPINEPHELUS.

a. Dorsal spines eleven.

b. Second dorsal spine higher than third or fourth.

c. Caudal fin rounded: interorbital area unusually broad; preopercle with a stout tooth below its angle; second anal spine much shorter than third; scales small (about 115); color dusky, without distinct markings anywhere in the adult; size very large, approaching that of *Promicrops* ..... NIGRITUS, 14.

cc. Caudal fin lunate; preopercular angle little salient, without enlarged teeth; color brown, clouded with whitish; lower parts flushed with orange-red; small dark spots about eye; vertical fins broadly edged with blue-black ..... MORIO, 15.

bb. Second dorsal spine lower than third and fourth; caudal fin rounded.

d. Preopercle with two or three small teeth curved forward below its angle: scales mostly ctenoid; head large; pyloric cœca in increased number (*Schistorus*); second and third anal spines about equal in length: color brownish, with about eight darker cross bands; dark bands radiating from eye; a dark moustache above the maxillary; a dark blotch on back of tail. MYSTACINUS, 16.

dd. Preopercle without distinct antrorse plectroid armature.

e. Body not covered with round red or orange spots: spots, if any, whitish or bluish.

f. Caudal peduncle with a large quadrate black blotch above (sometimes obsolete in the young, and in very old examples).

g. Eye surrounded by conspicuous dark brown points; body with irregular darker cross-bars; preopercular angle little salient; third dorsal spine highest, 2½ in head; scales moderate (about 100); lower jaw little projecting; vertical fins broadly edged with yellow ..... STRIATUS, 17.

gg. Eye not surrounded by dark points; sides with steel blue or whitish spots and blotches; no dark cross-bars; lower jaw strongly projecting.

h. Angle of preopercle not salient, its serræ weak; pale spots on body scattered, those on breast distinct ..... SELLICAUDA, 18.

hh. Angle of preopercle salient, with strong teeth; pale spots on body regularly arranged; those on breast indistinct; pyloric cæca numerous ..... NIVEATUS, 19.

ff. Caudal peduncle without saddle-like blotch above.

i. Body, head, and fins dark brown, covered with small, pearly white stellate spots; lower parts reddish; preopercle without salient angle; fins not edged with black.. DRUMMOND-HAYI, 20.

ii. Body and fins without stellate spots.

j. Vertical fins edged with red; color brown, variegated with yellowish brown, black, and white; "external appearance labroid"; scales rather large, those below lateral line ciliated, those above and on belly smooth; second dorsal spine about as long as third; preopercle obscurely serrate, without prominent angle ..... LABRIFORMIS, 21.

jj. Vertical fins broadly edged with black; color reddish brown, nearly plain; preopercle with strong teeth at its angle; dorsal spines subequal, rather low; interorbital space of moderate width..... GIGAS, 22.

ee. Body and head covered with red or orange spots (brown or blackish in spirits).

k. Vertical fins broadly edged with blue-black, their bases unspotted; body without pale spots; the orange spots rather small; lower jaw little projecting; preopercle with salient angle; size small..... APUA, 23

kk. Vertical fins without dark edge; their bases spotted like the body; body with large pale spots besides the orange spots; young with large black blotches at base of dorsal; lower jaw strongly projecting; angle of preopercle not salient; form robust, ASCENSIONIS, 24.

aa. Dorsal spines ten; caudal rounded; body with faint dark cross shades, and many round dark orange spots, these extending on the fins; vertical fins not edged with black; preopercle without salient angle; lower jaw strongly projecting ..... ANALOGUS, 25.

14. Epinephelus nigritus. *Black Grouper; Jew-fish.*

Serranus nigritus, Holbrook, Ichth. S. Car., 1859, 173, pl. xxv, f. ii, and 1860 (Charleston); Günther, i, 1859, 134 (copied).

Epinephelus nigritus, Gill, Cat. Fish. E. Coast U. S., 1861, 30 (name only); Goode & Bean, Proc. U. S. Nat. Mus., 1878, 182; Goode & Bean, *op. cit.*, 1879, 139 (Pensacola); Goode, *op. cit.*, 1879, 115 (Indian River, Florida); Jordan & Gilbert, Syn. Fish. N. A., 1883, 541 (copied).

Habitat.—South Carolina and Florida.

This species reaches a very large size. It has been rarely obtained by naturalists, and is as yet unknown from the West Indies. On the

Florida coast it appears to be confounded with *E. itaiara*, under the name of Jew-fish or *Guasa*.

We have had no opportunity of studying it. Dr. Bean has preserved for us a section of the skin of a large individual weighing 300 pounds, a cast of which is in the United States National Museum. The scales of the lateral line are of the ordinary type, not showing the peculiarities of *Promicrops itaiara*.

The following table of measurements of this specimen has been kindly furnished us by Dr. Bean.

Species: *Epinephelus nigritus; current number of specimen*, 34883; *locality, off Block Island.*

	Millimeters.
Anterior nostril from tip of snout	136
Width of interorbital area	135
Length of maxillary	241
Intermaxillary	214
Length of mandible	327
Diameter of orbit	51
Length of first spine	48
Length of second spine	422+
Length of third spine	330
Length of last spine	64
Length of antecedent spine of soft dorsal	90
Length of longest ray	181
Length of last ray	106
Length of first spine of anal	23
Length of second spine	68
Length of third spine	70
Length of longest ray	203
Length of last ray	120
Dorsal	X, 15
Anal	III, 9
Ventral	I, 5
Gill-rakers	10+14

Weight, 300 pounds.

15. Epinephelus morio. *Red Grouper; Cherna Americana; Cherna de Vivero.*

Serranus morio, Cuv. & Val., Hist. Nat. Poiss., ii, 285, 1828 ("New York" and San Domingo); Dekay, New York Fauna, Fishes, 1842, 23 (copied); Günther, i, 142, 1859 (Cuba); Steindachner, Ichth. Beitr., v, 127, 1876 (Rio Janeiro); Poey, Repertorio, i, 197.

Epinephelus morio, Gill, Cat. Fish. E. Coast, 1861, 28 (name only); Poey, Syn. Pisc. Cub., 1868, 285 (Havana); Poey, Enum. Pisc. Cub., 15; Jordan & Gilbert, Proc. U. S. Nat. Mus., 1878, 379 (Beaufort, N. C.); Goode, *op. cit.*, 1879, 115 (St. John's River; Indian River); Goode & Bean, *op. cit.*, 1879, 139 (Pensacola); Bean, *op. cit.*, 1880, 99 (Bermuda); Poey, Anal. Hist. Nat., 319, 1881 (Puerto Rico); Goode & Bean, *op. cit.*, 1882, 238 (name only); Jordan & Gilbert, *op. cit.*, 1882, 272 (Pensacola); Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West); Jordan & Gilbert, Syn. Fish. N. A., 1883, 510; Bean, Cat. Fishes Exhib. London, 60, 1883 (Key West, Fla.); Jordan, Proc. U. S. Nat. Mus., 1884, 124 (Key West).

Serranus erythrogaster, Dekay, New York Fauna, Fishes, 1842, 21, tab. 19 (Florida); "Storer, Synopsis, 1846, 30" (copied); Holbrook, "Ichth. S. Carol., 1860, 29, pl. 5, fig. 2" (Charleston); Günther, i, 133 (copied).

Epinephelus erythrogaster, Gill, Cat. Fishes East Coast U. S., 30, 1861 (name only).

Serranus remotus, Poey, Memorias Cuba, ii, 140, 1860 (Havana).

Habitat.—Atlantic coast of America: Virginia to Rio Janeiro.

Head, 2½ (3⅓); depth, 2⅔ (3½). D. XI, 16; A. III, 8, or III, 9. Scales, 24–140–x. Length, 11 inches.

Body comparatively deep and compressed, highest under front of spinous dorsal, its greatest width 2½ in greatest depth. Head large, moderately pointed, the anterior profile rather steep and nearly straight. Mouth rather large, the maxillary reaching slightly beyond eye, its length 2¼ in head. Lower jaw not strongly projecting. Teeth moderate, in rather narrow bands; two moderate canines in the front of each jaw, the lower smaller. Eye large, 5 in head (young). Interorbital space narrow, its width 7½ in head, the outline of the bone (under the flesh) transversely concave. Nostrils small, round, subequal. Preopercle moderately serrate, its angle slightly salient; teeth at the angle a little enlarged. Gill-rakers rather slender, about 15 below the angle.

Scales small, mostly ctenoid. Dorsal spines high, slender but pungent, the first less than half the second, which is highest, 2⅓ in head; the outline of the fin thence almost straight to the tenth spine, which is 1⅔ in the second; soft dorsal not elevated; caudal fin lunate, the outer rays a little produced, 1⅔ in the head; caudal peduncle comparatively slender; soft part of anal rounded, its longest ray 2⅔ in head; second anal spine somewhat stronger but not longer than third, 4½ in head. Pectorals reaching slightly beyond tips of ventrals, 1⅓ in head. Pyloric cœca 25 (Poey).

Color in life, olive-gray or olive-brown, clouded with paler olive, with no clear red shades except on jaws and lower part of sides of head and breast, these regions being usualy a salmon-color. Besides these, very irregular rounded blotches of grayish white over the body; preorbital, suborbital region, and snout, with numerous round points of dark orange-brown, most numerous on preorbital, these points brown in spirits; inside of mouth posteriorly bright orange; iris gilt.

Vertical fins colored like the body, the shades from the body extending on them; soft dorsal, anal, and caudal, with a broad ridge of blue-black, with a narrow whitish edge; spinous dorsal narrowly edged with blackish; ventrals, slightly dusky; pectorals, light olive.

With age, this species becomes more and more of a flesh-red, especially below and on mouth; the pale spots and blotches are less distinct in old examples.

This species is the most abundant of the genus on our coasts, where it is known almost universally as Red Grouper. It appears to range farther northward than any other, except perhaps *Mycteroperca mi-*

crolepis. It reaches a smaller size than the latter. In the Havana market it is also common, most of the individuals, however, being brought from the Florida Keys. For this reason it is known in Havana as *Cherna Americana* or *Cherna de Vivero*, the common "*Cherna*" being there *E. striatus*.

16. **Epinephelus mystacinus.** *Cherna de lo Alto.*

Serranus mystacinus, Poey, Memorias Cuba, i, 52, 1851, tab. 10, f. 1 (Cuba); Günther, i, 109, 1859 (South America).

Schistorus mystacinus, Poey, Repertorio, ii, 154, 1868; Poey, Synopsis Pisc. Cubens., 1868, 287; Poey, Enumeratio Pisc. Cubens., 1875, 18.

Habitat.—West Indies.

Head, $2\frac{3}{7}$ ($3\frac{1}{6}$); depth, $2\frac{5}{9}$ ($3\frac{2}{3}$). D. XI, 15; A. III, 9. Scales, 22–105. Length, 10 inches.

Body oblong, rather deep, somewhat compressed; its thickness $2\frac{2}{3}$ in its depth. Head large, rather obtuse, the anterior profile little convex and not steep. Mouth moderate, the broad maxillary reaching posterior border of eye, $2\frac{1}{4}$ in head. Teeth rather strong; those below mostly biserial, those above in a narrow band. Canines small, shorter than the depressible teeth of the inner series, those of the lower jaw scarcely differentiated. Lower jaw little projecting. Posterior nostril larger than anterior, nearly round. Eye large, $4\frac{1}{2}$ in head. Interorbital space slightly convex, 6 in head. Preopercle rather sharply serrate, the posterior limb nearly vertical, not emarginate, the angle nearly a right angle, its serrations considerably enlarged, coarse, variable in form, some of the lower ones usually hooked fowards. Lower limb straight, its edge otherwise entire.

Opercle with three distinct spines, larger than in any other of our species. Gill-rakers short and thick, much as in *E. afer*, about 15 below the angle.

Scales mostly ctenoid, those on head small; none visible on the maxillary and few on lower jaw. Lower jaw with 5 or 6 large mucous pores on each side, more distinct than in our other species.

Dorsal spines rather strong and high, the first nearly half the second, which is considerably higher than the tenth; third spine longest, $2\frac{2}{3}$ in head; second, fourth, fifth, and sixth, but little shorter; soft dorsal rather high. Caudal rounded, its longest ray $1\frac{3}{5}$ in head; anal rounded, its longest ray $2\frac{1}{6}$ in head. Second anal spine stronger than third, which is of the same length, $3\frac{2}{3}$ in head. Pectorals reaching slightly beyond tips of ventrals, $1\frac{3}{5}$ in head. Pyloric cœca many (Poey).

Color in life, dull olive-brown, the body grayish brown crossed by 8 bands of dark olive-brown, the one on caudal peduncle broader than the others, darkest on back of tail; these bands which are more conspicuous in life than those of other species of this genus become faint in spirits. A dark moustache along edge of maxillary. Three dark bands across cheek, almost disappearing in spirits. Dorsal dull olive, the bands of sides extending on the scaly parts; caudal and anal dull

olive; the anal, dusky in spirits; ventrals, blackish. Pectorals, light olive-brown. Mouth, bluish within.

This species seems to inhabit deeper water than most of the foregoing and to reach but a small size. One specimen was obtained by Professor Jordan at Havana, where it was called *Cherna de lo Alto*. Although this species is a somewhat peculiar one, we cannot regard it as the type of a distinct genus (*Schistorus*).

According to Poey, the skull of this species does not deviate from the usual type in *Epinephelus*.

The strong resemblance of *Epinephelus mystacinus* to the Japanese *E. susuki*, C. & V. (=*Serranus octocinctus*, Temminck & Schlegel) has been noticed by Dr. Günther.

17. Epinephelus striatus. *Nassau Grouper; Cherna criolla; Hamlet.*

Cherna, Parra, Peces y Crustaceos Cuba, 1787, 50, lam. xxiv (Cuba).

Anthias striatus, Bloch, Ichth., ix, 109, tab. 324, 1792 (on a figure by Plumier): Bloch & Schneider, Syst. Ichthyol., 1801, 305 (copied).

Lutjanus striatus, Lacépède, Hist. Nat. Poiss., iv, 324, 1803 (copied).

Serranus striatus, Cuv. & Val., ii, 1828, 288 (Gulf of Mexico); Storer, "Syn. Fish. N. A., 1846, 27" (copied); Guichenot, Ramon de la Sagra's Hist. Cuba, Poiss., 1850, 12 (Cuba); Günther, i, 1859, 110 (Cuba; Mexico; Puerto Cabello; Bahia); Poey, Repertorio, i, 198, 1867; Vaillant & Bocourt, Mission Scientifique au Mexique, 1875–'76 (Cuba; San Domingo; Martinique; Jamaica).

Epinephelus striatus, Gill, Proc. Ac. Nat. Sci. Phila., 1865, 105 (name only); Poey, Repertorio, ii, 285, 1868 (Havana); Poey, Syn. Pisc. Cub., 1868, 310; Poey, Enum. Pisc. Cub., 1875, 15; Goode, Bull. U. S. Nat. Mus., v, 1876, 57 (Bermudas); Cope, Trans. Am. Phil. Soc., 1871, 466 (New Providence; St. Croix); Bean, Proc. U. S. Nat. Mus., 1880, 99 (Bermuda); Poey, Anales Hist. Nat., 319, 1881 (Puerto Rico); Jordan & Gilbert, Syn. Fish. N. A., 1883, 918; Poey, Bull. U. S. Fish Comm., 1882, 118; Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Anthias cherna, Bloch & Schneider, Syst. Ichth., 1801, 310 (after Parra).

Sparus chrysomelanurus, Lacépède, iv, 1803, 160 (on a copy of Plumier's figure).

Habitat.–West Indies, Key West, and Bermudas to Bahia.

Head, $2\frac{4}{7}$ ($3\frac{1}{4}$); depth, $2\frac{7}{9}$. D. XI, 17; A. III, 8. Scales, 21–100–x. Length, 11 inches.

Body rather deep, not strongly compressed; its greatest width, $2\frac{2}{5}$ in depth. Head somewhat pointed; the anterior profile nearly straight to the front of the dorsal. Mouth moderate, the lower jaw little projecting, the maxillary reaching posterior border of eye, $2\frac{1}{3}$ in head. Teeth in moderate bands: two moderate canines in front of each jaw, the lower smallest. Nostrils close together, the posterior a little the larger, ovate. Eye rather large, $5\frac{1}{2}$ in head (young). Interorbital space narrow, flattish, or somewhat concave, $8\frac{1}{2}$ in head. Angle of preopercle slightly salient: a shallow notch above it: the teeth at the angle somewhat larger. Gill-rakers slender, about 16 below the angle.

Scales moderate, strongly ctenoid.

Dorsal spines of moderate strength, higher than in most species: the second much higher than tenth, the third highest, $2\frac{1}{2}$ in head; soft

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dorsal rather high; caudal rounded, $1\frac{2}{7}$ in head. Soft anal rounded, the largest ray $2\frac{1}{4}$ in head. Second anal spine stronger than third and about as long, 4 in head. Pectorals reaching tips of ventrals, $1\frac{1}{3}$ in head.

Color in life, rather pale olivaceous gray, paler below, and with obscure whitish clouds along sides. Body with about 4 vertical bars, very irregular and undulating, of an olive-brown color, darker on the back, and all extending on the dorsal fin; a square blotch of jet black on back of tail; a band of dark olive through eye and on snout, meeting its fellow on shoulder, just before dorsal; another on median line of snout, forking opposite front of eye, the two bands extending backward parallel and ceasing abruptly on occiput without reaching the other band; dark shades radiating from eye below; a ring of deep brown or blackish points around eye, the upper ones on eye; a deep orange-red stripe on lower edge of preorbital; mouth within partly orange; lower parts of head and breast tinged with orange and with coppery cloudings; vertical fins colored like the parts of the body nearest them; edge of both dorsals yellow; caudal and anal tipped with orange yellow; ventrals blackish, faintly yellowish at tips; pectorals, chiefly light orange, dusky at base.

The bands and dark markings of body become fainter in old examples of this species, and almost disappear in alcoholic specimens.

This species is one of the commonest food-fishes both at Key West and Havana, being called at the former place Nassau Grouper, and at the latter *Cherna criolla*, or simply *Cherna*. It reaches a considerable size, probably not less than that of *E. morio*. The great majority of those seen in the markets are, however, small, less than 18 inches in length.

18. Epinephelus sellicauda.

Epinephelus sellicauda, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 250 (Cape San Lucas); Jor. & Gilb., Proc. U. S. Nat. Mus., 1881, 229 (Socorro Island); Jor. & Gilb., *op. cit.*, 1882, 360 (Cape San Lucas); Jor. & Gilb., *op. cit.*, 1882, 371 (Colima); Jor. & Gilb., *op. cit.*, 1882, 625 (Panama); Jor. & Gilb., Bull. U. S. Fish Comm., 1882, 107 (Mazatlan).

Serranus sellicauda, Günther, Fishes Centr. Amer., 1869, 409 (Panama); Steindachner, Ichth. Beitr., iv, 1871, 5 (Panama).

Epinephelus ordinatus, Cope, Trans. Am. Philos. Soc., 1871, 466 (Panama).

Habitat.—Pacific coast of tropical America; Cape San Lucas to Panama, generally common.

Head, $2\frac{1}{2}$ ($3\frac{1}{8}$); depth, 3 ($3\frac{1}{2}$). D. XI, 15; A. III, 8. Scales, 16–93–x. Length (28213, Revillagedos), $11\frac{1}{2}$ inches.

Body oblong, moderately compressed, the back somewhat elevated. Head rather slender and sharp, anteriorly pointed, the profile nearly straight from the tip of the lower jaw to the base of the dorsal. Snout sharp, $3\frac{1}{3}$ in head. Lower jaw strongly projecting. Mouth moderate,

the maxillary extending to slightly beyond eye, its length $2\frac{1}{5}$ in head. Canines moderate; about equal in the two jaws. Nostrils subequal, roundish. Eye large, $5\frac{1}{2}$ in head. Interorbital space narrow, convex, its width 9 in head. Preopercle weakly and bluntly serrate, its angle evenly rounded, without evident notch or salient angle. Gill-rakers rather short, about 16 on lower limb of arch.

Scales moderate, ctenoid. Dorsal spines strong, the fourth, fifth, and sixth longest; 3 in head. Soft dorsal not very high. Caudal slightly convex, $2\frac{1}{5}$ in head. Longest anal ray $2\frac{3}{5}$ in head. Second anal spine about as long as third, $4\frac{1}{8}$ in head. Pectorals short, reaching little past tips of ventrals, $1\frac{4}{5}$ in head.

Color, in spirits, dark brown everywhere, on head, body, and fins much clouded with roundish pale blotches; these most distinct on breast and lower parts of head. A conspicuous black blotch on back of caudal peduncle. Fins rather pale, darker toward their edges, spotted like the body, the spots smaller and fainter.

This species is generally common on the Pacific coast of tropical America, where it is a food-fish of some importance. It bears considerable resemblance to *E. niveatus* of the Atlantic.

19. Epinephelus niveatus.

Serranus niveatus, Cuv. & Val., ii, 1828, 380 (Brazil); Castelnau, Anim. nouv. ou rares de l'Amér. du Sud, Poiss., pl. i, f. 2 (coast of Brazil); Günther, i, 130 (copied); Poey, Repertorio, i, 202.

Epinephelus niveatus, Poey, Synopsis Pisc. Cubens., 1868, 286 (Havana); Poey, Enum. Pisc. Cubens., 1875, 15; Jordan & Gilbert, Syn. Fish. N. A., 1883, 541.

? Serranus margaritifer, Günther, Cat. Fish. Brit. Mus., i, 1859, 131 (South America).

Serranus conspersus, Poey, Memorias Cuba, ii, 139, 1860 (Havana); Poey, Repert., ii, 157, 1868.

Hyporthodus flavicauda, Gill, Proc. Ac. Nat. Sci. Phila., 1861, 98 (young specimen, taken at Newport, R. I.); Cope, Proc. Ac. Nat. Sci. Phila., 1870, 119 (same specimen).

? Epinephelus flavolimbatus, Poey, Repertorio, i, 1867, 183; ii, 1868, 157 (Cuba); Poey, Synopsis Pisc. Cubens., 1868, 286; Poey, Enum. Pisc. Cub., 1875, 15.

Habitat.—West Indies, Brazil, Aspinwall (Gilbert), occasionally straying northward.

Head, $2\frac{3}{8}$ (3), depth, $2\frac{9}{10}$ ($3\frac{1}{2}$). D. XI, 14; A. III, 9. Length (9804, Havana), $6\frac{1}{4}$ inches.

Body oblong, compressed, the back elevated; the anterior profile somewhat convex, the snout short, rather sharp, its length $3\frac{3}{4}$ in head. Mouth large, the maxillary extending to below posterior margin of eye, its length 2 in head. Canines rather strong, especially in upper jaw. Lower jaw considerably projecting. Eye rather large. Preopercle with its angle decidedly salient, armed with stronger teeth, the emargination above the angle slight. Interorbital space flattish, its width $7\frac{1}{2}$ in head. Gill-rakers moderate, about 15 on lower limb of arch.

Scales moderate.

Dorsal spines rather high, the fourth about $2\frac{3}{5}$ in head. Soft dorsal of moderate height. Caudal truncate, 2 in head. Anal moderate, its sec-

ond spine about as long as third, $3\frac{3}{8}$ in head; longest soft ray $2\frac{1}{3}$. Pectorals not reaching to the tips of the long ventrals, $1\frac{2}{10}$ in head.

Color of young specimen in alcohol brown, with round whitish spots on the body rather smaller than the pupil, rather regularly arranged in vertical and horizontal series; about 5 in a horizontal row and 4 in a vertical one. These rows show some irregularities, and some smaller spots are mingled with the larger ones. No distinct spots on breast. A very large black blotch on upper part of caudal peduncle, much larger than in *E. sellicauda*, and extending to below lateral line; a dark moustache above edge of maxillary; fins nearly plain, probably yellowish in life, the dorsal with a median row of round dusky spots on the membranes.

We have never seen this species in life, and have for study at present only a young example sent by Professor Poey to the National Museum. There seems to be considerable variation in its coloration, dependent on age and on other circumstances.

The *Serranus margaritifer* seems to be the same species.

We know nothing of *Epinephelus flavolimbatus** Poey, except from Professor Poey's descriptions. From these we infer that he has correctly identified this as the adult of this species, of which his *niveatus* and *conspersus* are the young. In the *flavolimbatus* Poey counts but seven pyloric cœca, while a larger number has been assigned to *E. niveatus*. The caudal saddle seems to disappear with age. It is also apparently wanting in the very young.

20. Epinephelus labriformis.

Serranus labriformis, Jenyns, "Zool. of Beagle, Fishes, p. 8, pl. 3, 1842 (Galapagos Archipelago)"; Günther, Cat. Fishes Brit. Mus., i, 152, 1859 (copied).

Habitat.—Galapagos Islands.

This species does not appear to have been taken since the voyage of the Beagle. There seems to be little to justify the epithet of "labriform," several times applied to it by Mr. Jenyns.

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* The following is a translation of the more important parts of the original description of *Epinephelus flavolimbatus:*

I have never seen this fish at Havana. It is found at Matanzas in one of the deepest parts of the bay.

Specimen described 705 millimeters long. Height, $3\frac{3}{8}$ in total length. Head, $3\frac{1}{8}$. D. XI, 14; A. III, 9; P. 18.

Eye 6 in head. Preopercle with strong spines at its angle. Maxillary reaching to below posterior part of orbit. Upper jaw with 2 short unequal canines on each side; lower jaw with one.

Second dorsal spine as long as third. Second spine of anal robust, $5\frac{1}{2}$ times in head. Caudal fin rather rounded than truncate.

Scales small, ciliated.

Color brownish or ashy pearly; head with green dashes like moustaches. Dorsal and paired fins pale violet, the former with its edge of a bright canary yellow, fading after the fifth soft ray. Pectoral also bordered with yellow on its entire margin, especially above; anal and caudal darker than the ground color. Pyloric cœca 7, short and firm.

Later, Professor Poey expresses his opinion that this species is the adult of *E. niveatus*.

21. Epinephelus gigas.

Perca gigas, Brünnich, "Ichthyol. Massiliensis, 65, No. 81," 1768 (Marseilles).
Holocentrus gigas, Bloch & Schneider, Syst. Ichth., 1801, 322 (copied).
Serranus gigas, Cuv. & Val., ii, 270, pl. xxxii, 1828; Günther, i, 132, 1859 (Madeira; Cape of Good Hope); Steindachner, Ichth. Berichte, iv, 11, 1867 (excl. syn. pars; Barcelona; Tangier; Lisbon; Teneriffe); Steindachner, Ichth. Beitr., xii, 6, 1882 (comparison with *Epinephelus caninus*); Steindachner, Ichth. Beitr., 1876, v. 127 (Canary Is.; Madeira; Cape Verde; Cape of Good Hope; Brazil); Day, British Fishes, 16, pl. v (south coast of England).
Cerna gigas, Doderlein, Rivista del Genere Epinephelus o Cerna, 1883, 10 (detailed description and synonymy).
Holocentrus merou, Lacépède, Hist. Nat. Poiss., iv, 377, 1803 (after Brünnich).
Serranus mentzeli, Cuv. & Val., ii, 291, 1828 (coast of Brazil); Günther, i, 140, 1859 (copied).
? *Serranus dichropterus*, Cuv. & Val., ii, 293, 1828 (Brazil; not type, which was from Japan, having been also the type of *Holocentrus ongus* Bloch).
Perca robusta, Couch, "Mag. Nat. Hist., 1832, v., 21, f. 7" (Polperro).
Serranus marginatus, Lowe, "Proc. Zool. Soc. Lond., 1833, 142" (Madeira).
Serranus fimbriatus, Lowe, "Trans. Cambr. Phil. Soc., 1836, p. 195, pl. i" (Madeira).
Serranus cirrioides, Capello, "Journ. Sci. Math., ii, 1867 156" (Portugal).
Serranus ongus, Günther, i, 1859, 142 (Bahia; not *Holocentrus ongus*, Bloch, a Japanese fish).
? *Epinephelus brachysomus*, Cope, Trans. Am. Phil. Soc. Phila., 1871, 466 (Rio Janeiro).

Habitat.—Coasts of Europe and Northern Africa; islands of the Eastern Atlantic; coast of Brazil.

We have not studied this species, and give most of the above synonymy on the authority of Dr. Steindachner, who has compared specimens from the Mediterranean with others from Brazil without finding any difference. Besides the several European names, Steindachner refers here the name *mentzeli*, C. & V. This identification seems probable. We have also ventured to refer here the Brazilian specimens of *Serranus dichropterus* of C. & V., and of *Serranus ongus*, Günther. According to Peters, the orginal *Holocentrus ongus* of Bloch, which specimen became also the type of *Serranus dichropterus*, C. & V., was a Japanese fish, *Serranus moara*, Temminck & Schlegel. The latter species should therefore stand as *Epinephelus ongus*.

The very young fish from Rio Janeiro in the museum of the Academy at Philadelphia, which is the type of Cope's *Epinephelus brachysomus*, seems to us to belong to this species. At any rate it is no other of those admitted here.

22. Epinephelus drummond hayi. *Hind; Speckled Hind; John Paw.*

Epinephelus drummond-hayi, Goode & Bean, Proc. U. S. Nat. Mus., 1878, 173, 174 (Pensacola; Bermuda); Goode & Bean, *op. cit.*, 1879, 115, 139 (Pensacola); Jordan & Gilbert, *op. cit.*, 1882, 272 (Pensacola); Jordan & Gilbert, Syn. Fish. N. A., 1883, 540 (copied).

Habitat.—Pensacola; Bermudas.

This species is not uncommon about Pensacola in rather deep water. Fishermen say that it is also occasionally taken at Key West, although

no specimens have yet been sent from there. It also occurs in the Bermudas, but no one has observed it anywhere in the West Indies. It does not reach a very large size. The "Speckled Hind" is a beautiful fish, the most attractive in coloration of any of our species of the genus.

As it has already been well described in these proceedings, it is not necessary to give a full account of it here.

23. Epinephelus apua. *Cabrilla; Red Hind.*

Pirati apia, Marcgrave, Hist. Bras., 158, 1648 (Brazil).

Cugupugnacu Brazil, the Hind, Catesby, Nat. Hist. Carol., &c., 1743, tab. 14 (Bahamas).

Cabrilla, Parra, Peces y Crustaceos Cuba, 1787 (Havana).

? *Perca guttata*, Linnæus, Syst. Nat., x, 1758, 292 (in part?; after Marcgrave, Sloane, Willoughby, Ray, and Catesby); ? Linnæus, Syst. Nat., xii, 485, 1766; ? Gmelin, Syst. Nat., 1788, 1315 (copied).

Epinephelus guttatus, Goode, Bull. U. S. Nat. Mus., v, 1876, 58 (Bermudas); Jordan & Gilbert, Syn. Fish. N. A., 1883, 919, 973 (specimens examined from Florida Keys); Bean, Proc. U. S. Nat. Mus., 1880, 99 (Bermuda; Florida).

? *Bodianus apua*, Bloch, Ichthyol., vii, 37, t. 229, 1790 (Brazil; erroneous; from a figure by Prince Maurice); Lacépède, iv, 1803, 296 (copied).

Serranus apua, Cuv. & Val., ii, 1828, 287 (Brazil; citing as synonym Piratiapia of Marcgrave); Günther, i, 140, 1859 (Jamaica); Steindachner, Ich. Notiz., vi, 43, 1867 (Barbadoes; Surinam); Günther, Shore Fishes, Challenger Exp. 1880, 6 (St. Thomas).

Epinephelus apua, Jordan & Gilbert, Syn. Fish. N. A., 973 (name only).

Lutjanus lunulatus (bis), Bloch & Schneider, Syst. Ichthyol., 1801, 329 (after *Cabrilla*, Parra).

Serranus lunulatus, Cuv. & Val., ii, 1828, 379 (after Parra); Steindachner, "Ichthyol. Mittheil., ix, 1866, 15"; Poey, Repertorio, i, 200.

Epinephelus lunulatus, Poey, Synopsis Pisc. Cubens., 1868, 286; Poey, Enum. Pisc. Cub., 1875, 16 (Havana); Cope, Trans. Am. Philos. Soc., 1871, 465 (St. Martin's; St. Kitt's; New Providence).

? *Bodianus marginatus*, Bloch & Schneider, Syst. Ichthyol., 1801, 331 (based on *Pirati apia*, of Marcgrave.)

Serranus catus, Cuv. & Val., ii, 373, 1828 (Martinique); Guichenot, Ramon de la Sagra, Cuba, ii, 13, 1850.

Serranus maculatus var. *catus*, Peters, Berliner Monatsber., 1865, 110 (Martinique; Barbadoes; Puerto Cabello).

Serranus arara, Cuv. & Val., ii, 1828, 377 (Havana; erroneously identified with *Bonaci ararà*, Parra); Poey, Repertorio, i, 200.

Serranus maculatus, Günther, i, 1859, 130 (West Indies; not *Perca maculatus*, Bloch); Vaillant & Bocourt, Mission Scientifique au Mexique, iv, 1875, 83 (Jamaica).

Epinephelus cubanus, Poey, Repert. Fis.-Nat. Cuba, i, 1867, 202 (Cuba); Poey, Syn. Pisc. Cub., 1868, 287; Poey, Enumeratio Pisc. Cub., 1875, 17.

Serranus maculatus var. *cubanus*, Peters, Berliner Monatsber., 1865, 110 (Cuba).

Habitat.—West Indies; Florida Keys; Bermudas; Brazil.

Head, $2\frac{1}{2}$ ($3\frac{1}{7}$); depth, $3\frac{1}{3}$ ($4\frac{1}{8}$). D. XI, 16; A. III 8. Scales 19–100–x. Length, 7 inches.

Body rather slender, moderately compressed, the back somewhat elevated, the greatest thickness of the body $2\frac{2}{3}$ in its greatest depth.

Head rather long and pointed; its anterior profile regularly and rather weakly arched. Mouth not very large, the maxillary reaching to below posterior margin of eye; its length $2\frac{1}{3}$ in head; lower jaw rather weak, its tip little projecting; teeth rather strong, in moderate bands; both jaws with two moderate, curved canines, those in the upper jaw largest. Eye large, $4\frac{1}{3}$ in head, rather longer than snout. Interorbital space very narrow, anteriorly concave, its width 11 in head; nostrils small, round, close together, the posterior largest. Preopercle weakly serrate, with a salient angle, which is armed with stronger teeth; a shallow emargination above the angle. Gill-rakers slender, of moderate length, about 15 developed below the angle.

Scales of moderate size, rather strongly ctenoid.

Dorsal spines rather slender but pungent, the second spine considerably higher than the tenth, the third and fourth longest, $2\frac{1}{2}$ in head; soft rays lower than the highest spines; caudal fin rounded, its length 2 in head. Anal rather high, posteriorly rounded, its longest soft rays $2\frac{2}{5}$ in head. Second anal spine somewhat stronger than third and rather longer, 3 in head. Pectorals rather narrow, reaching past tips of ventrals, $1\frac{2}{3}$ in head.

Color in life, light yellowish olive above, whitish below. Three broad oblique obscure bands of olive running upward and backward on sides; spots on body vivid scarlet red, those above a little darker, the edges of the scales being brown. Inside of mouth mostly pale, partly scarlet. Belly spotted. Dorsal olive-yellow, somewhat clouded, a few red spots on spinous dorsal. Soft dorsal broadly edged with black. Caudal yellowish, the posterior half black, its edge white. Anal like soft dorsal. Pectorals, light yellow, with rows of small scarlet spots. Ventrals red, blackish at tips. Branchiostegal membrane spotted like body. The olive bands on sides disappear in spirits, and the red spots above become brown, those below gray.

This is one of the smaller species of the genus, rarely exceeding 18 inches in length. It is very abundant in the Havana market, where it is known as *Cabrilla*.

The synonymy of this species has been very greatly complicated. Goode has adopted for it the name *Epinephelus guttatus*, erroneously crediting the name *guttatus* to Gmelin, and also erroneously stating that it is based on a figure by Catesby. The name *guttatus* dates from Linnæus, and is based on a number of figures given by prior authors, that of Catesby being one of these, but apparently not the one which should be regarded as the type of the species. For a discussion of the application of the name *Perca guttata*, see our remarks on the synonymy of *Enneacentrus guttatus*.

Of the remaining synonyms, *lunulatus*, *catus*, and *ararà* seem without much doubt to belong here. *Cubanus* is said to differ only in having the eyes smaller and the color of the body of a darker shade.

Poey has rejected the earlier name *apua*, on account of the erroneous figure given by Bloch (seven dorsal spines, &c.), and has preferred the name *lunulatus*. But this latter name seems to us an untenable one in any case, although no doubt exists as to its proper identification with this species. Bloch & Schneider describe a *Lutjanus lunulatus* Park. Then lower down on the same page, among the *species dubiæ*, is a second *Lutjanus lunulatus* based on the *Cabrilla* of Parra. By what accident or misprint this arrangement was brought about, we do not know. We do not, however, think that the second of these duplicated names should be accepted.

The figure of Bloch is exceedingly bad, showing nine dorsal spines, the body scarlet, marked with jet black spots, &c. The only fairly distinctive feature shown is that of the black margins of the vertical fins, and this feature is shown equally by *Mycteroperca venenosa guttata*, a species which in some respects agrees better with the figure than the present species does. If we reject the name *apua*, and its synonym, *marginatus*, as perhaps we ought to do, the oldest tenable name of the species will be *Epinephelus catus*, C. & V.

24. Epinephelus ascensionis. *Cabra Mora; Rock Hind.*

? *Pixa pixanga*, Marcgrave, Hist. Brazil, &c., 1648, 152 (Brazil; probably belongs here).

Trachinus ascensionis, Osbeck, Reise in China, &c., 1757, and English edition 1771, 96 (Ascension Island).

Epinephelus ascensionis, Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Trachinus punctatus or *Trachinus ascensionis*, Bonnaterre, Tableau Encycl. Method., 1788, 46 (after Osbeck).

? *Perca stellio*, Walbaum, Artedi Piscium, 1792, 349 (after Seba).

Holocentrus punctatus, Bloch, Ichthyol. (about 1792), viii, taf. 241 (very bad, after Marcgrave).

Epinephelus punctatus, Poey, Enum. Pisc. Cubens., 1875, 16 (Cuba); Poey, Anales Soc. Hist. Nat. Madrid, 1881, 319 (Madrid).

Perca maculata, Bloch, Ichthyol. (about 1795), taf. 313 (very bad; on a figure by Plumier; not *Holocentrus maculatus*, Bloch, tafel 242, an East Indian species of *Epinephelus=Holocentrus albofuscus*, Lac.).

Serranus maculatus, Peters, Berliner Monatsber., 1865, 109 (identification of *Perca maculata*, Bloch).

Trachinus osbeck, Lacépède, Hist. Nat. Poiss. (after Osbeck).

Sparus atlanticus, Lacépède, iv, 158, pl. 5, f. i, 1803 (based on a copy of Plumier's drawing).

Epinephelus atlanticus, Jordan & Gilbert, Syn. Fish. N. A., 1883, 918 and 973.

Serranus nigriculus, Cuv. & Val., ii, 375, 1828 (Martinique).

? *Serranus pixanga*, Cuv. & Val., ii, 383, 1828 (based on Marcgrave); Poey, Repertorio, i, 203.

Serranus impetiginosus, Müller & Troschel, Schomburgk's Hist. Barb., 665, 1848; Günther, i, 142, 1859 (Trinidad.); Günther, Proc. Zool. Soc. Lond., 1868, 225 (St. Helena; name only); Günther, Shore Fishes, Challenger, 1880, 5 (Ascension); Steindachner, Ichth. Beitr., v., 127, 1876 (Bahia; Maranhaõ).

Serranus maculatus var. *impetiginosus*, Peters, Berl. Monatsber., 1865, 110.

Epinephelus impetiginosus, Poey, Repertorio, i, 201; Poey, Syn. Pisc. Cubens., 286, 1868 (Cuba); Jordan & Gilbert, Syn. Fish. N. A., 1883.

Serranus capreolus, Poey, Memorias Cuba, ii, 1860, 145 (Cuba); Vaillant & Bocourt, Mission Scientifique au Mexique, 87 (Gulf of Mexico; Brazil; Ascension).

Epinephelus capreolus, Jordan & Gilbert, Syn. Fish. N. A., 1883, 539 (specimen from Key West described).

Serranus varius, Bocourt, Ann. Sci. Nat. Paris, 1868, 222 (Gulf of Mexico).

Habitat.—Florida Keys; West Indies; Brazil; Ascension Island; St. Helena.

Head, $2\frac{2}{5}$ ($2\frac{10}{17}$); depth, 3 ($3\frac{2}{3}$). D. XI, 17; A. III, 7, or III, 8. Scales, 15–100–x. Length, $12\frac{3}{4}$ inches.

Body comparatively robust, little compressed, the greatest thickness 2 in depth. Head, subconic, acute, its anterior profile straight from tip of snout to nape, thence slightly gibbous. Mouth rather large, the maxillary reaching rather beyond the eye, $2\frac{1}{3}$ in head. Lower jaw rather strongly projecting, more prominent than in any other of the Epinepheli. Teeth in rather broad bands, the canines short and stout, those of the lower jaw larger than those of the upper. Eye moderate, 6 in head. Interorbital space flattish, not very narrow, its width 6 in head. Nostrils subequal, roundish. Preopercle finely serrate, its outline strongly convex, with a very slight emargination. Gill-rakers rather short and thick, 15 below the angle.

Scales moderate, mostly strongly ctenoid. Dorsal spines rather strong, the third and fourth longest $3\frac{1}{5}$ in head, the outline of the fin little convex, the second spine about as long as tenth; caudal fin slightly rounded, 2 in head. Longest anal ray, $2\frac{1}{2}$. Second anal spine stronger than third, the length equal, $3\frac{2}{3}$ in head. Pectorals broad, reaching much beyond the tips of the short ventrals, $1\frac{1}{5}$ in head. Pyloric cœca 12 (Poey).

Color in life, olivaceous gray, with darker clouds. A number of irregular whitish blotches, roundish, mostly rather larger than pupil, scattered over different parts of the body; 5 roundish blackish blotches, ill-defined along sides of back, the 4 under the dorsal fin extending up on the fin, these disappearing with age. Head and body everywhere covered with round orange-brown spots of varying sizes, the centers more orange, the borders rather brown; the spots largest on breast, smallest on lips and upper parts, equally distinct everywhere. Mouth pale within its roof with red spots. Dorsal light olive, with rather sparse spots, colored like those of the body, but smaller. No dark edge to dorsal or anal. Numerous whitish spots on dorsal, especially on soft dorsal. Caudal pale olive, with some paler spots. Anal reddish, marked like dorsal, its spots larger. Basal half of pectoral similar, outer part plain olive. Ventrals pale, with orange spots. The orange-brown spots of body and head become brown in spirits.

This species is widely distributed through the Western Atlantic. It apparently does not reach a large size, although usually larger, as seen in the markets, than *apua*. It is not rare either at Havana or Key West, although in neither locality abundant. It is considered a finer

food-fish than any of the others. At Key West it is known as *Rock Hind*, and at Havana as *Cabra Mora*.

The synonymy of this species is very complicated. We have adopted the name *ascensionis** from Osbeck as referring without much doubt to this species, although the description is scanty. The probability of the correctness of this identification is heightened by the record of this species from the same island (Ascension) by Dr. Günther. If Osbeck's name be rejected as unidentifiable, the names *punctatus* Bonnaterre and *osbecki* Lacépède must go with it, while the names *punctatus* and *maculatus* of Bloch are preoccupied in this genus. Our choice lies, therefore, between *ascensionis* Osbeck and *atlanticus* Lacépède. We think that the certainty of identification is sufficient to warrant us in preferring the former name. Of the remaining synonyms, *nigriculus*, *impetiginosus*, *capreolus* and *varius* undoubtedly belong to the present species, and probably *pixanga* also. For the identification of Bloch's *maculatus* and Lacépède's *atlanticus* we have relied on the authority of Peters.

25. Epinephelus analogus.

Epinephelus analogus, Gill, Proc. Ac. Nat. Sci. Phila., 1863, 163 (Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 232 (Acapulco); Jordan & Gilbert, *op. cit.*, 1882, 376 and 625 (Panama); Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 107, 110 (Mazatlan; Panama).

Serranusanalogus, Günther, Fishes Centr. Amer., 1869, 410 (Panama); Steindachner, Ichth. Beitr., iv, 1871, 5 (Acapulco; Mazatlan; Panama).

Serranus courtadré, Bocourt, An. Sci. Nat., Paris, 222, 1868 (La Unione; San Salvador); Vaillant & Bocourt, Mission Scientifique au Mexique, 1875, 80.

Habitat.—Pacific coast of tropical America.

Head, $2\frac{2}{5}$ (3); depth, 3 ($3\frac{2}{3}$). D. X, 17; A. III, 8. Scales, 18–100–x. Length (4944, Panama), $12\frac{1}{4}$ inches.

General form of *Epinephelus ascensionis*, the body oblong, rather robust. Head moderately acute, the anterior profile straight from tip of snout to above eye, thence moderately convex. Snout short, $4\frac{3}{4}$ in head. Mouth large, oblique, the maxillary reaching to beyond eye, its length $2\frac{1}{4}$ in head. Lower jaw strongly projecting, as in *E. ascensionis*. Ca-

* The following is Osbeck's description, as given in the English edition of his Voyage to China, London, 1771, Vol. II, p. 96: "*Tranchinus Adscensionis*. This fish tastes exceedingly well, and is distinguished from others by the following marks: The *dorsal-fin* has 28 rays, the *pectoral-fins* 18, the *ventral-fins* 5, the *anal-fin* 11, the tail 16, and the *membrana branchiostega* 6 rays: the latter is white, with brown spots; the single dorsal fin is everywhere of equal breadth, and runs from the head to the tail: its first 11 rays are sharp-pointed; the pectoral fins are obovated and so are the ventral-fins, and their first ray is prickly: the first 3 rays of the anal-fin, which is likewise obovated, are prickly: the tail is wedge-shaped, with short rays: the body is somewhat compressed and not quite round, covered with a white skin, on which the brown spots run into one another; the *head* is somewhat compressed; the *opercula branchiostega* consist of three scales, of which the middlemost ends in two teeth: one of them is long and pointed: the *eyes* are near each other, in the upper part of the head, and are large: the *nostrils* are round: besides them are two greater holes in the forehead: the *teeth* are fixed in the gums and throat in several rows; they are numerous, long, and very sharp: five of them are longer, namely, three in the upper jaw and two in the lower; the *jaws* are equal in length."

nine teeth short, those of lower jaw small. Eye rather large, $5\frac{2}{3}$ in head. Interorbital space gently convex, its width $7\frac{2}{3}$ in head. Nostrils round, subequal. Preopercle well serrate, its outline strongly convex, without distinct emargination. Gill-rakers moderate, about 15 below angle of arch.

Scales moderate, rather strongly ctenoid. Dorsal spines rather strong, the third and fourth subequal, $3\frac{1}{2}$ in head. Caudal fin slightly rounded, $1\frac{5}{10}$ in head. Anal high, its longest ray $2\frac{2}{3}$ in head. Second anal stronger than third, but rather shorter, 5 in head. Pectorals reaching beyond tips of ventrals, $1\frac{5}{6}$ in head.

Color, in spirits, brown, clouded with darker and with faint dusky cross-bars; body and fins everywhere covered with roundish dark-brown spots. These are larger and fewer below; smallest and most numerous on the fins, and everywhere very distinct. Soft dorsal with 3, spinous dorsal with about 2 rows of dark spots. In life they are probably orange-brown, on an olivaceous ground, as in *E. ascensionis*, to which species, as the name indicates, this fish is extremely analogous. No distinct dusky edgings to fins. No evident dark blotches along base of dorsal.

This species is generally common on the Pacific coast of Tropical America, where it represents *E. ascensionis* of the Atlantic. It differs from the latter species, as well as from all other known *Epinepheli*, in the possession of but 10 dorsal spines. This number is constant in all the many specimens examined.

IV.—Genus ALPHESTES.

ALPHESTES, Bloch & Schneider, Syst. Ichthyol. 1801, 236 (*afer*).
PROSPINUS, Poey MSS., Gill, Proc. Ac. Nat. Sci. Phila., 1862, 237 (*chloropterus=afer*).
PLECTROPOMA sp., Auct. (*nec typus*).

We adopt the name *Alphestes* for those species which differ from *Epinephelus* proper in the presence of a strong antrorse spine on the lower limb of the preopercle. In this respect the species approach the genera *Plectropoma* and *Hypoplectrus*, with which group they have usually been associated. The three species admitted by us are very similar in form and evidently closely related. All of the species of *Alphestes* are American. All the species are of small size, most of them smaller than any of the true *Epinepheli*.

ANALYSIS OF SPECIES OF ALPHESTES.

a. Second anal spine considerably longer than third, its length more than one-third head; head small; scales mostly cycloid.
  b. Preopercle with two antrorse spines below the angle; silvery white, with rose-colored markings; maxillary extending to below middle of eye ....PICTUS, 26.
  bb. Preopercle, with a single strong antrorse spine below its angle.
    c. Olivaceous, the ground color nearly uniform, the body and fins closely covered with small dark-brown spots; breast plain; snout slender, pointed; lower jaw rather strongly projecting .....MULTIGUTTATUS, 27.
    cc. Olive, clouded with dusky, the body with rather few dark orange spots; breast with pearly spots; a dark mustache above the maxillary; lower jaw little projecting.....AFER, 28.

26. Alphestes pictus.

Plectropoma pictum, Tschudi, Fauna Peruana, p. 5, 1844 (coast of Peru); Günther, i, 164, 1859 (copied).

Habitat.—Coast of Peru.

Known only from the description of Tschudi. In color, at least, it seems to differ from *A. multiguttatus*, which it approaches in other respects.

The following is the substance of Tschudi's original description:

D. XI, 17; A. III, 9. Depth, $2\frac{1}{3}$ in length. Head, 3. Eye half length of lower jaw. Cleft of mouth extending to below middle of eye. On angle of preopercle is a thin broad tooth directed forward; before it one longer and stronger. Teeth of ascending limb of preopercle sharper. upward and more distinctly separated. Fourth dorsal spine longest. Caudal convex. Anal rounded. Second anal spine longer than third. Ventrals extending slightly beyond tips of pectorals.

Ground color silvery white, with irregular markings of bright rose-color.

Rare on the coast of Middle Peru; more common in Chili. Often seen in the markets of Valparaiso.

27. Alphestes multiguttatus.

Plectropoma multiguttatum, Günther, Proc. Zool. Soc., London, 1866, 600 (Panama).

Alphestes multiguttatus, Jordan & Gilbert, Bull. U. S. Fish Comm., 1882, 107, 110 (Mazatlan; Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 375.

Epinephelus multiguttatus, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 625 (Panama).

Plectropoma afrum, Günther, Fishes Centr. Amer., 1869., 411 (Panama).

Habitat.—Pacific coast of tropical America.

Head, $2\frac{2}{5}$ (3); depth, $2\frac{1}{5}$ ($3\frac{1}{3}$). D. XI, 16; A. III, 9. Scales, 13–80–x. Length (29519, Panama), $7\frac{1}{4}$ inches.

Body oblong ovate, compressed. Head small, slender, and pointed, the profile nearly straight from the snout to behind the eye, where is formed a considerable angle; the outline thence steeper, but still nearly straight to the front of the dorsal fin. Snout very short, rather pointed, $5\frac{1}{2}$ in head. Mouth small, oblique, the maxillary not reaching to posterior margin of eye, its length $2\frac{2}{5}$ in head. Teeth small; small canines present in upper jaw only. Lower jaw rather strongly projecting. Eye large, $4\frac{1}{2}$ in head. Interorbital space very narrow, convex, its width 10 in head. Preopercle strongly convex; the angle not salient, but armed with sharp radiating serræ.

Below the angle is a strong flattish spine directed downwards and forwards, as in *A. afer*. Nostrils small, round, close together, subequal. Gill-rakers moderate, about 14 on lower limb of arch.

Scales not very small, mostly cycloid; those on opercles somewhat enlarged.

Dorsal spines rather short and stiff, the fourth 3 in head. Soft dorsal high. Caudal subtruncate, 2 in head; anal rather high, rounded, the longest rays 2 in head. Second spine longer and stronger than third, $2\frac{4}{5}$ in head. Pectorals broad, reaching a little beyond tips of ventrals, $1\frac{2}{3}$ in head.

Color, in spirits, dark brown, the body and head profusely covered with round spots of a darker brown, their diameter about half that of the pupil. Spots on posterior part of body confluent in horizontal streaks; breast and front of head with few spots; a very faint mustache above maxillary. Dorsal and caudal dusky olive, nearly plain; anal with two cross-bands of dusky; pectoral yellowish, with 5 dusky cross-bands, its edge pale; ventrals dusky.

This little fish is rather common on the Pacific coast of Mexico and tropical America, where it represents *A. afer* of the Atlantic. In form, size, and general appearance the two resemble each other closely. The coloration is, however, quite different, and there are some small differences in form, the Pacific fish having a slenderer head, with more prominent lower jaw.

28. Alphestes afer. *Guaseta.*

Epinephelus afer, Bloch, Ichthyologia (about 1795), tab. 327 (Guinea?).

Alphestes afer, Bloch & Schneider, Syst. Ichthyol., 1801, 236 (copied); Peters, Berliner Monatsber., 1865, 105 (identification of Bloch's type with *chloropterum* and *monacanthus*); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 375.

Plectropoma chloropterum, Cuv. & Val., ii, 398, 1828 (San Domingo; Martinique); Poey, Memorias, i, 73, tab. 9, f. 3, 1851 (Cuba); Vaillant & Bocourt, Miss. Sci. au Mexique, 1875, 107, pl. v, f. 3; Poey, Repertorio, i, 265, 1867 (Hayti; Martinique; Brazil).

Prospinus chloropterus, Poey, Syn. Pisc. Cubens., 1868, 289; Poey, Enum. Pisc. Cubens., 1875, 18.

Plectropoma monacanthus, Müller & Troschel, Schomburgk's Hist. Barbadoes, 665, 1848 (Barbadoes); Günther, i, 1859, 164 (copied).

Alphestes monacanthus, Cope, Trans. Am. Philos. Soc., 1871, 467 (St. Martin's).

Habitat.—West Indies.

Head, $2\frac{1}{7}$ ($3\frac{1}{5}$); depth, $2\frac{2}{3}$ ($3\frac{1}{3}$). D. XI, 17; A. III, 9. Scales, 14–80–x. Length, $7\frac{1}{2}$ inches.

Body oblong, ovate, rather compressed, the greatest width $2\frac{1}{4}$ times in the depth. Head small, rather pointed, the profile nearly straight from the tip of the snout to the nape, there forming a considerable angle, being steeper and more gibbous to the front of the dorsal fin. Snout short, shorter than eye; mouth small, the maxillary extending a little beyond the eye, its length $2\frac{2}{3}$ in head. Teeth comparatively small, in broad bands, the upper jaw with about four small canines, the canines of the lower jaw scarcely differentiated. Lower jaw rather weak, little projecting. Eye large, $4\frac{1}{2}$ in head. Interorbital space, moderate, convex, its width 6 in head. Preopercle strongly and unequally convex, its upper limb oblique, without notch above the angle.

Upper limb of preopercle with slender teeth which regularly increase in size downward, those at the rounded angle strong; below the angle is a strong flattish spine, directed forwards and downwards, its length 4 in eye. Nostrils small, round, close together.

Scales not very small, mostly cycloid, those on opercles larger than those on body, those on cheeks small.

Gill-rakers short and stout, their length not more than half pupil, about 12 below angle.

Dorsal spines rather short, robust and pungent, the second higher than the tenth, the fourth and fifth highest, $2\frac{1}{3}$ in head, the outline of the fin gently curved; soft rays about as high as third spine; caudal convex behind, its angles rounded, its length $1\frac{2}{3}$ in head. Anal rather high, posteriorly rounded, its longest soft rays 2 in head. Second anal spine longer and stronger than third, $2\frac{2}{3}$ in head. Pectorals broad, rounded, extending beyond tips of ventral, $1\frac{2}{3}$ in head.

Color in life, dark brownish olive, mottled with darker blotches. Body with some dark orange spots. Vertical fins dark olive, mottled with darker blotches. Yellow under head. Pectorals dull olive red, with bluish spots. Ventrals dull olive, edged with darker. Some pearly spots on breast and on anal. Moustache, dark-red brown.

The orange spots become brown in spirits.

This species is not uncommon on the coast of Cuba, numerous specimens having been obtained by Professor Jordan at Havana. It reaches a length of less than a foot, and is known to fishermen as *Guaseta*.

For the identification of the *afer* of Bloch with *monacanthus* and *chloropterus* we are indebted to Peters. The genus *Alphestes* (*Prospinus*) seems to be fairly well founded. We cannot regard it, however, as having any special affinity with most of those called by Cuvier "*Plectropoma*."

V.—Genus ENNEACENTRUS.

BODIANUS, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 237 (not of Bloch, whose type is properly *Bodianus bodianus*, Bloch=*Labrus rufus*, L.).
ENNEACENTRUS, Gill, Proc. Ac. Nat. Sci. Phila., 1865, 105 (*ouatalibi=punctatus*).
PETROMETOPON, Gill, Proc. Ac. Nat. Sci. Phila., 1865, 105 (*guttatus=cruentatus*).
MENEPHORUS, Poey, Ann. Lyc. Nat. Hist. N. Y., about 1867 (*dubius*).

This genus was first indicated by Dr. Gill, under the name *Bodianus*, adopted from Bloch. The original *Bodianus*, Bloch was a heterogeneous assemblage of Labroid and Percoid fishes. The name *Bodianus* came from the Portuguese vernacular name (*Bodiano*) one of its species called by Bloch *Bodianus bodianus* (=*Harpe rufa*, Auct.). As the name *Bodianus* "was originally proposed more especially for the *Bodianus bodianus*, it must either be retained for that type or consigned to that oblivion to which the utterly worthless nature of its original constitution so richly entitles it."—(Gill.) Later, this group was divided by Dr. Gill into two *Enneacentrus* and *Petrometopon*. This division seems to us imprac-

ticable for the present, as the crania of but two of the numerous species (*guttatus*, *fulvus*) have as yet been examined. We unite all nine-spined *Epinepheli* in a single generic group, *Enneacentrus*.

ANALYSIS OF SPECIES OF ENNEACENTRUS.

a. Caudal fin rounded or subtruncate.

b. Sides with nine or ten dark cross-bands; sides of head and jaws with many round bluish or yellowish spots; a large jet-black spot behind eye; vertical fins edged with blue; lower jaw much projecting; preopercle very finely serrulate, its angle not salient; scales rather large (lat. l. about 80); second anal spine longest; caudal much rounded. ..... PANAMENSIS, 29

bb. Sides without cross-bands.

c. Skull convex between orbits (*Petrometopon*, Gill); body, head and fins more or less covered with scarlet or orange spots; about four round inky spots along base of dorsal; lower jaw not strongly projecting; caudal fin much rounded; scales rather large (lat. l. about 80) ..... GUTTATUS, 30.

cc. Skull channeled between orbits (*Enneacentrus*); head and body with few or many small blue dark-edged spots; lower jaw strongly projecting.

d. Snout with one or two blue stripes; back of tail without conspicuous black blotch; caudal rounded; scales small (lat. l. about 115) ..... TÆNIOPS, 31.

dd. Snout without stripes; back of tail with two black spots; lower jaw with a black spot at tip; caudal subtruncate; scales moderate (lat. l. about 90). FULVUS, 32.

aa. Caudal fin lunate (*Menephorus*, Poey); carmine red, the head and body sprinkled with blue dark-edged spots; preopercle without salient angle.. DUBIUS, 33.

29. Enneacentrus panamensis.

Serranus Panamesis, Steindachner, Ichth. Beitr., iv, 1871, 1 (Panama).

Habitat.—Panama.

This species is known only from Steindachner's description and excellent figure.

30. Epinephelus guttatus. *Enjambre; Coney; Rough Hind.*

a. Scarlet variety (*guttatus*).

Cugupuguacu, Willoughby, Appendix, pl. 6, f. 1 (Brazil; not of text, p. 303; not of Marcgrave, fide Poey).

Perca guttata, Linnæus, Syst. Nat., x, 1758, 292 (in part, after Marcgrave, Sloan, Willoughby, Ray, and Catesby); Linnæus, Syst. Nat., xii, 485, 1766; Gmelin, 1788, 1355 (copied; perhaps the brown variety).

Perca guttata, Bloch, Ichthyol., pl. 312, about 1795 (description and figure from a drawing by Plumier).

Serranus guttatus, Castlenau, "Anim. nouv. ou rares, S. Amer., about 1850, i" (Brazil).

Sparus cruentatus, Lacépède, Hist. Nat. Poiss., iv, 157, tab. 4, f. 1, 1803 (on a copy of Plumier's drawing).

Serranus apiarius, Poey, Memorias Cuba, ii, 143, 1860 (Havana).

Petrometopon apiarius, Poey, Synopsis Pisc. Cubens., 1868, 288; Poey, Enum Pisc. Cubens., 1875, 20 (name only).

Serranus coronatus, (pale variety) Günther, i, 124, 1859 (Puerto Cabello; Cuba, Jamaica, and Trinidad); Cope, Trans. Am. Philos. Soc., 1871, 466 (St. Croix; New Providence).

b. Brown variety (*coronatus*).

Serranus coronatus, Cuv. & Val., ii, 371, 1828 (Martinique); Poey, Repertorio, i, 198, 1868.

Serranus coronatus var. *nigriculus*, Günther, i, 1859, 124.

Petrometopon guttatus, Poey, Synopsis Pisc. Cub., 1868, 288 (Havana); Poey, Enum. Pisc. Cubens., 1875, 19.

Epinephelus guttatus, Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Habitat.—West Indies to Brazil, var. *coronatus* extending northward to Florida Keys.

Head, $2\frac{1}{2}$ ($3\frac{1}{4}$); depth, $2\frac{5}{6}$ ($3\frac{1}{2}$). D. IX, 14; A. III, 8. Scales, 14–80–x. Length, $8\frac{1}{2}$ inches.

Body oblong, rather deep and compressed, its width $2\frac{1}{4}$ in greatest depth. Head moderate, a little acute anteriorly, the profile nearly straight from snout to nape, where it is rather convex. Mouth rather large, the maxillary extending somewhat beyond eye, its length $1\frac{7}{8}$ in head. Lower jaw not strongly projecting. Teeth in narrow bands, the depressible teeth of the inner series very long and slender, longer than in any other of our species, those of the lower jaw and front of upper especially enlarged, longer than the small, subequal canines. Eye large, 5 in head; interorbital space narrow, with a median depression, its width 7 in head. Preopercle convex, very weakly serrate, its posterior angle obliquely subtruncate, without salient angle or distinct emargination. Opercle with three distinct spines. Nostrils small, subequal. Gill-rakers slender.

Scales rather large, mostly ctenoid.

Dorsal spines rather slender and pungent, the fourth and fifth spines highest, $3\frac{2}{3}$ in head, the outline of the fin gently arched. Caudal very convex, its middle rays $1\frac{3}{5}$ in head, their length $1\frac{2}{5}$ times that of the outer rays. Anal rounded, its longest ray half head. Second anal spine a little stronger than third and slightly longer, $2\frac{2}{3}$ in head. Pectorals long, reaching much past tip of ventrals, $1\frac{1}{2}$ in head.

Coloration of brown variety, CORONATUS.—In life, whitish or dusky olive, somewhat translucent, the head decidedly greenish. Spots everywhere, all bright orange-red, darker in the center, those on the edges of the vertical fins darker maroon, or cherry color. Four larger spots along base of dorsal, inky black, irregular, the third largest, the fourth smallest. A very small one on each side of shoulder. Eyes green above, with red specks, iris yellow. Fins rather bluish. Tips of ventrals dusky. Tips of vertical fins appearing so, from the darker color of the spots. In spirits the bright spots become brown or fade into the ground color; those on the head mostly disappearing.

Scarlet variety, GUTTATUS.—The coloration in life differs from the above in having the ground hue a livid reddish gray, a little paler below, and the spots are vermilion, usually darker posteriorly. The spots are larger than in the preceding, especially anteriorly.

In spirits the vermilion spots become light gray, except posteriorly,

where they are brown. Those on the head remain very distinct, those above never disappearing.

Professor Poey regards the two forms above noted as distinct species, calling the red one *apiarius*, the brown one *guttatus*. So far as we can see, the two are absolutely identical in every respect except color. We cannot, therefore, regard them as distinct species, but think them color varieties, dependent on the depth of the water or the character of the bottom. The differences are certainly less than those separating var. *punctatus* from *E. fulvus*.

Both forms are extremely common in the markets of Havana, where they are known without distinction as *Enjambre*. At Key West only the brown form was seen, and this is there paler and more olivaceous than at Havana. It is there not very common, and is known as Coney or Rough Hind. This is one of the smallest species of *Epinephelus*, rarely exceeding a foot in length.

The nomenclature of this species is still unsettled. If we do not adopt for it the Linnæan name *guttatus*, the oldest remaining name is clearly that of *cruentatus*, Lacépède.

It is also somewhat uncertain as to which of the two varieties is intended in some of the earlier descriptions. Our views of each of these are expressed in the above synonymy.

NOTE ON PERCA GUTTATA, LINNÆUS.—In the tenth and twelfth editions of the Systema Naturæ, as well as in Gmelin's edition, appears the following account of the *Perca guttata*:

GUTTATA. 14, P. pinnis dorsalibus unitis, cauda integra, corpore punctis sanguineis adsperso.

Marcgr. bras. 169, Cugupuguacu.
Sloan. jam. 2, *p.* 280, *t.* 247, *f.* 2.
Will. icht. 303, *t.* 1.
Raj. pisc., 127.
Catesb. car. 2, *p.* 14, *t.* 14.
Habitat.—America.

The earliest of these references in point of time is that of Marcgrave, and, if we are not mistaken, each of the later writers conceived that his specimen was identical with Marcgrave's fish.

We are indebted to Professor Poey for an outline of Marcgrave's account. The species is not figured. From the text it appears that the *Cugupuguacu* is a gigantic fish ("piscis ingens"), its body, with the tail, being 6 feet in length. It has a single dorsal fin, spinous in front; its caudal is quadrate; its scales are small. The head, back, and sides are gray in color, this hue mixed with darker shades. Fins, including the caudal, dilute brown; whole head, back, sides, and pectoral fins with small black scattered spots. Belly and the rest of the fins, with the tail, without spots.

This fish is manifestly neither *Epinephelus apua* nor *Enneacentrus cruentatus*. It is most probably *E. itaiara*.

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The figure in Sloane's Jamaica we have not seen. From Mr. Goodes' remarks we infer that it might be identified with *E. apua*.

Willoughby has (according to Poey *in lit.*) copied the description of Marcgrave, adding to it in the appendix a figure of a fish seven to eight inches long which he conceives to be Marcgrave's species. This figure, according to Poey, probably represents *Epinephelus cruentatus*. It is certainly not the original *Cugupuguacu* intended. Ray's work is not accessible to us, but his description is probably a copy of that given by Willoughby.

Catesby's figure of "the Hind" was supposed by its author to represent the *Cugupuguacu* of Marcgrave, with which he erroneously identifies the Bermuda Hind. Goode observes (Bull. U. S. Nat. Mus., 1876, v, 59), "the figure of Catesby agrees precisely with the Bermuda Hind [*E. apua* of this paper] except in the small matter of the number of the dorsal spines, a matter of detail not likely to have been noticed by Catesby, judging from his other figures." Of the correctness of this identification of Catesby's figure there can be no doubt. Finally, we may observe that a skin of *E. apua* is now (according to Dr. Bean) in the possession of the Linnæan Society of London; a specimen belonging to Linnæus's own collection, and labeled by him *Perca guttata*. This specimen is, however, not referred to in the Systema Naturæ, and cannot therefore be properly taken in evidence as the original type of the species.

Five courses are therefore possible as to the Linnæan name *guttatus* in the genus *Epinephelus*.

1. To consider *Cugupuguacu* of Marcgrave the type, and to regard Marcgrave's fish as unidentifiable, thus suppressing the name *guttatus*.

2. To regard *Cugupuguacu* of Marcgrave the type, and to identify this with Lichstentein's *itaiara*, thus using the name *guttatus* instead of *itaiara*.

3. To consider that the use of the name *Perca guttata* by Bloch for a single species, restricted in some sense the complex Linnæan name to Willoughby's figure, which is supposed to represent the species figured by Bloch. This view would substitute *guttatus* for *cruentatus*, and is the view adopted by Poey.

4. To regard the Linnæan specimen as fixing the type of *Perca guttata* to the species figured by Catesby, with which this specimen is thought to be identical. This would substitute *guttatus* for *apua*.

5. To consider the Linnæan *guttata* a mélange of unrelated and partially unidentified species which should be altogether ignored.

It is certain, as Poey has observed (*in lit.*), that although Linnæus probably intended the name "*guttata*" for Marcgrave's fish, he did not fix his attention on the original "ingens piscis" of Marcgrave,

but relied for his diagnosis on some of the later authors, most likely on the figures of Willoughby or Catesby. The fish he had in view in forming his diagnosis was probably either *E. apua* or *cruentatus*. For *E. cruentatus* Bloch soon after retained the name *guttatus*, and in this he has been followed by Poey. This arrangement probably best accords with the custom of naturalists generally.

As a matter of fact, justice, and perhaps convenience also, would be best served by adopting the fifth of the above alternatives. Linnæus had Marcgrave's fish in mind as his type, but derived his knowledge of it from other authors who had never seen it, and whose accounts refer to other fishes, and to more than one other species.

31. Enneacentrus tæniops.

?Perca punctata, Bonnaterre, Tabl. Encycl. Meth., 1788, 130 (Senegal; not of Linnæus).

Serranus tæniops, Cuv. & Val., ii, 370, 1828 (Cape Verde); Günther, i, 121, 1859 (St. Vincent); Steindachner, Fische Afrikas, 1881, 4, taf. 1 ("very common on the coast of Senegambia to the Cape Verde Islands and Guinea; rare on the coasts of the Bahama Islands to Florida").

Bodianus tæniops, Jordan & Gilbert, Syn. Fish. N. A., 1883, 919 (copied).

Habitat.—West Indies; Florida; Cape Verde Islands; west coast of tropical Africa.

This species has not been studied by us. Steindachner mentions specimens with the ground color red and others dark golden brown or blackish brown. The color varieties probably resemble those of *E. fulvus* and *E. guttatus*.

32. Epinephelus fulvus. *Guativere; Nigger-fish; Yellow-fish; Coney; Butter-fish.*

a. Yellow variety (*fulvus*).

Turdus cauda convexa (the Yellow-fish), Catesby, Nat. Hist. Carolina, 1743, pl. x, f. 2.

Labrus fulvus, Linnæus, Syst. Nat., ed. x, 1758, 287 (after Catesby); Linnæus, Syst. Nat., ed. xii, 1766, 479.

Guativere (*amarilla*), Parra, Descr. Dif. Piezas, Hist. Nat. Cuba, 1787, 7, lam. v, f. 2 (Cuba).

Holocentrus auratus, Bloch, Ichthyol., vii, 57, 1792, taf. 236 ("East Indies"); Bloch & Schneider, Syst. Ichthyol., 1801, 314.

Serranus auratus, Cuvier & Valenciennes, ii, 364, 1828 (copied); Peters, Berlin. Monatsber., 1865, 103 (identification of *Holocentrus auratus*, Bloch).

Bodianus guativere, Bloch & Schneider, Syst. Ichth., 1801, 336 (based on both Parra's figures).

Serranus guativere, Cuv. & Val., ii, 383, 1828 (on Parra's second figure); Müller & Troschel, "Schomb. Hist. Barbad., 1848, 665"; Cope, Trans. Am. Philos. Soc., 1871, 466 (New Providence); Poey, Repertorio, i, 203.

Habitat.—West Indies; Bermudas; Florida Keys.

b. Scarlet variety (*ouatalibi*).

Carauna, Marcgrave, Hist. Brasil, 1648, 147 (Brazil).

Guativere, Parra, Descr. Dif. Piezas, Hist. Nat., 1787, lam. v, f. 1 (Cuba).

Perca punctata, Bloch, Ichthyol., about 1795, 314 (on a figure by Plumier).

Gymnocephalus ruber, Bloch & Schneider, Syst. Ichthyol., 1801, 346, taf. 67 (on *Carauna* of Marcgrave; not *Epinephelus ruber*, Bloch).

Serranus ouatalibi, Cuv. & Val., ii, 381, 1828 (Havana); Guichenot, Ramon de la Sagra, Cuba, Poiss., 1845, 15 (Havana); Müller & Troschel, Schomburgh's Exped. Barbad., 1848, 665 (Barbadoes); Günther, i, 1859, 120 (Jamaica; Cape Verde); Cope, Trans. Am. Phil. Soc., 1870, 466 (St. Croix; New Providence; St. Kitt's); Poey, Repertorio, i, 202, 1867.

Serranus carauna, Cuv. & Val., ii, 384, 1828 (Brazil); Castelnau, Anim. nouv. Amér. Sud, 1, pl. i, f. 1 (Brazil).

c. Brown variety (*punctatus*).

Perca marina puncticulata (the NEGRO-FISH), Catesby, Nat. Hist. Carolina, &c., 1743, pl. 7 (Bahamas).

Perca punctata, Linnæus, Syst. Nat., x, 1758, 291 (based on Catesby); Linnæus, Syst. Nat., xii, 1766, 485.

Enneacentrus punctatus, Poey, Syn. Pisc. Cubens., 1868, 288 (Cuba); Goode, Bull. U. S. Nat. Mus., v, 1876, 59 (Bermudas).

Epinephelus punctatus, Jordan & Gilbert, Syn. Fish. N. A., 1883, 541.

Bodianus punctatus, Jordan & Gilbert, Syn. Fish. N. A., 919 (name only).

Perca punctulata, Gmelin, Syst. Nat., 1788, 1315 (after Catesby).

Enneacentrus punctulatus, Poey, Enum. Pisc. Cubens., 20, 1875 (Havana).

Head, $2\frac{3}{8}$ ($3\frac{1}{4}$); depth, 3 ($3\frac{3}{8}$). D. IX, 15; A. III, 9. Scales, 15–90–x. Length, 8 inches.

Body oblong, moderately compressed, its greatest width $2\frac{1}{3}$ in depth. Head rather pointed anteriorly, the profile forming an even curve from snout to base of dorsal. Mouth moderate, the maxillary extending somewhat beyond eye, its length 2 in head. Lower jaw strongly projecting. Teeth in narrow bands, rather large, the depressible teeth smaller than in *E. cruentatus;* canines rather small, subequal. Eye large, 5 in head; interorbital space narrow, flattish, with a median depression, its width 7 in head. Preopercle with weak serrations, its outline convex, with a slight and shallow emargination, its angle not salient. Opercle with 3 distinct spines. Nostrils small, subequal. Gill-rakers slender.

Scales rather large, mostly ctenoid. Dorsal spines slender, pungent, the fourth and fifth highest, the outline of the fin above nearly straight. Caudal truncate, its angles slightly rounded, its longest rays $1\frac{5}{7}$ in head, scarcely longer than the outer rays. Anal high, rounded, its longest rays 2 in head. Second anal spine stronger and rather longer than third, $2\frac{3}{8}$ in head. Pectoral long, reaching much past tips of ventrals, $1\frac{1}{2}$ in head.

COLORATION.

(*a*) Brown variety (*punctatus*).—Color in life blackish olive. Spots everywhere on sides and head, dark blue with light blue centers. Dorsal fin dusky olive, edged with darker, a few spots on its base; the soft dorsal margined with whitish. Caudal dusky olive. Anal and ventrals violaceous black. Pectorals olivaceous. The spots in spirits become brown, with gray centers.

(*b*) Red variety (*ouatilibi*).—Color in life vivid scarlet. Spots on head nearly black; others light blue, with a purplish border. Two black spots

on lower jaw and two on back of tail. Caudal paler than body, with a few scattering dark points. Ventrals and anal edged with dusky. Pectorals paler than dorsal. In spirits this fish becomes pale, almost cream-color. Spots on head dark, the others brown, with grayish margins.

(*c*) Yellow variety (*fulvus*).—Color in life lemon yellow, being somewhat orange red on the back. Two black spots on back of tail; a few sky-blue spots on body anteriorly and on head, with darker margins; a few violet spots about eye. Fins colored like body. Head, pectorals, and dorsal a little redder than rest of fish. Edge of spinous dorsal blackish. Color in spirits olivaceous yellow.

This species is very abundant throughout the West Indies, and apparently reaches a smaller size than any other of our *Epinepheli*. It is brought in great numbers to the markets of Havana, where it is known as *Guativere*, the yellow variety being distinguished as *Guativere Amarilla*. No specimens have yet been obtained in Florida, but Key West fishermen say that the "Nigger-fish" is not uncommon there. We have seen none over a foot in length.

The color variations in this species are greater and more constant than in any of the other species, and have early attracted attention. We find no difference whatever among the different forms except in the coloration, and we believe that at present no naturalist regards them as different species.

In the Havana market the typical or red variety is most abundant; next comes the brown form, which much resembles the red, while the yellow variety, which is peculiar in its markings as well as in its ground color, is rather rare. These differences are probably due to the character of the bottoms, and perhaps in some degree to differences in depth of water.

The name of this species has been somewhat unsettled for different reasons. There is, however, apparently no room for question as to the name to be adopted, the name *Labrus fulvus* of Linnæus having clear priority and belonging without any doubt to the yellow variety of this fish.

Some confusion has arisen from the fact that Linnæus has, in his twelfth edition, by some inadvertence, left two species with the same name, *Perca punctata*, his "*Perca punctatus*" being No. 4, on page 482, and "*Perca punctata*" No. 20, on page 485. In the tenth edition, however, the former is not found, and it is from this, the earliest binomial name given to any American *Epinephelus*, that the name *punctatus* must be dated. The "*Perca punctatus*" No. 4 was probably originally intended to be placed in some other genus, as *Labrus* or *Sparus*, and then removed in the proof-reading to *Perca*. This seems the more probable as the number 4 is duplicated, *Perca zingel* standing without number, between *P. punctatus* and No. 3. This *Perca punctatus* is *Sciæna chrysura*, (Lac.) (=*argyroleuca*, Mitch.).

The remaining synonomy of *Epinephelus punctatus* requires no special remark. The name *punctulatus* of Gmelin has been used by Poey, through ignorance of the fact that the earliest use of the name *punctatus* is for the present species and not for the *Sciæna*.

33. Epinephelus dubius.

Serranus dubius, Poey, Memorias, ii, 142, 1860 (Cuba).
Enneacentrus dubius, Poey, Synopsis Pisc. Cubens., 289, 1868.
Menephorus dubius, Poey, Ann. Lyc. Nat. Hist. N. Y., x, 50, 1869; Poey, Enumeratio Pisc. Cubens., 1875, 21.
? *Menephorus punctiferus*, Poey, Enumeratio Pisc. Cubens., 21, 1875 (Cuba).

Habitat.—Coasts of Cuba.

We have not seen this species, and it appears to be very rare in the markets of Havana, the only locality where it has yet been noticed. Comparison of the descriptions published by Poey leads us to the belief that his *dubius* and *punctiferus* are not distinct species. The genus *Menephorus*, based on the lunate form of the caudal fin, does not appear to us to be needed. If retained, a similar genus should be established for the reception of *Epinephelus morio*.

VI.—Genus DERMATOLEPIS.

DERMATOLEPIS, Gill, Proc. Ac. Nat. Sci. Phila., 1861, 54 (*punctatus*).
LIOPERCA, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 237 (*inermis*).

This genus is accepted by us for two species, which, while evidently closely related to *Epinephelus*, show divergences in the direction of *Rhypticus*. These are shown in the form, the smooth scales, the small teeth, and numerous soft rays in the dorsal, as well as in other respects. The two known species are extremely similar, the generic characters supposed to distinguish *Dermatolepis* from *Lioperca* being due to differences of age and condition of specimens.

ANALYSIS OF SPECIES OF DERMATOLEPIS.

a. Preopercle weakly, but evidently serrate; upper jaw with very small canines; pectoral fins long, more than two-thirds length of head, reaching vent; anal spines rather strong; dusky olive, with large rounded whitish spots; no black spots on head; a whitish streak from snout through eye toward front of dorsal ..... INERMIS, 34.

aa. Preopercle subentire; canine teeth obsolete; pectoral fins short, not two-thirds length of head and not reaching vent; anal spines short; dusky olive, with round whitish spots; head with smaller black spots ..... PUNCTATUS, 35.

34. Dermatolepis inermis.

Serranus inermis, Cuv. & Val., Hist. Nat. Poiss., ix, 436, 1883 (Antilles); Poey, Memorias Cuba, i, 1851, 54, lam. 4, f. 2 (Cuba); Günther, i, 1859, 153 (Cuba); Poey, Repertorio, i, 198, 1867.
Lioperca inermis, Poey, Syn. Pisc. Cubens., 282, 1868 (Havana); Poey, Enum. Pisc. Cubens., 17, 1875.

Habitat.—West Indies.

Head, $2\frac{2}{5}$ ($3\frac{1}{3}$); depth, $2\frac{1}{2}$ ($3\frac{1}{6}$). D. XI, 19; A. III, 9. Scales 24–125–x. Length, 12 inches.

Body comparatively short and deep, strongly compressed, the back elevated, the anterior profile concave, forming a re-entrant angle before the eye, thence nearly straight to the nape. Head compressed, the snout short, moderately pointed, $3\frac{2}{3}$ in head. Eye small, $5\frac{3}{4}$ in head. Interorbital space narrow, anteriorly with a broad groove which receives the spines of the premaxillary bones; its width 8 in head. Posterior part of head narrow, strongly convex transversely. Mouth small, oblique, the jaws subequal, the broad maxillary extending to below the middle of the eye, its length $2\frac{1}{2}$ in head. Supplemental maxillary well developed. Teeth in narrow bands, formed as in other *Ephinepheli*, but small. Canines scarcely differentiated; none in lower jaw; one on each side in upper jaw slightly larger than the other teeth. Preopercle with very weak and irregular serrations, the angle not salient, its teeth little, if any, enlarged. A very slight emargination above the angle. Opercle with a single spine, above which is a flat lobe. Opercular flap unusually large, extending beyond the spine for a distance nearly equal to the diameter of the eye. Gill-rakers rather slender, about 14 on lower part of anterior arch. Nostrils round, very close together, the posterior the larger.

Scales small, cycloid, somewhat imbedded in the skin; lower jaw scaly; maxillary, preorbital, and tip of snout naked.

Dorsal spines strong, the third highest, $2\frac{1}{2}$ in head, the others gradually shorter to the ninth, which is $3\frac{1}{2}$ in head. Soft dorsal elevated, the twelfth ray highest, 2 in head. Caudal long, rounded in outline, $1\frac{1}{3}$ in head. Anal very high, the middle soft rays $1\frac{3}{5}$ in head, the other rays rapidly shortened each way. Anal spines short and strong, graduated, the second spine $3\frac{3}{4}$ in head.

Pectorals very long, nearly reaching anal, $1\frac{1}{5}$ in head. Ventrals moderate, $1\frac{5}{7}$ in head.

Color in alcohol dusky brown, mottled with darker. Head, body, and fins covered with roundish whitish blotches, which are very irregular in form and size, some of them larger than the eye. The spots most numerous and distinct on the tail and on the lower part of the head. Several spots behind the eye, confluent into a pale stripe from eye toward spinous dorsal. Fins all blackish, the pale spots smaller and generally less distinct than on body. Pectorals olivaceous, with small, rather distinct black spots.

A single specimen of this rare species was obtained for Professor Jordan in Havana by Leonel Plasencia.

This species is the type of the genus *Liopercа*, Gill. It differs, however, in no important respect from the type of the prior-named *Dermatolepis*. Bleeker has referred *Liopercа* to his genus *Serranichthys* (or *Cromileptes*). It is not, however, certain that *Serranichthys altivelis* really belongs to this type. It has a singularly slender head and 12 dorsal spines.

35. Dermatolepis punctatus.

Dermatolepis punctatus, Gill, Proc. Ac. Nat. Sci. Phila., 1861, 54 (Cape San Lucas); Gill, *op. cit.*, 1862, 250; Jordan & Gilbert, Proc. U. S. Nat. Mus., 229, 1881 (Socorro Island).

Habitat.—Lower California; Revillagigedo Islands.

Head, $2\frac{9}{10}$ ($3\frac{1}{2}$); depth, $2\frac{2}{5}$ (3). D. XI, 19; A. III, 9. Scales, 24–115–x. Length (28223, Revillagigedo Islands), 14 inches.

Body comparatively short and deep, strongly compressed, the back elevated, the anterior profile forming a slight re-entrant angle before the eye, thence nearly straight to the nape. Head compressed, the snout short, moderately pointed, 4 in head. Eye small, $6\frac{1}{3}$ in head. Interorbital space quite narrow, anteriorly with a broad groove, which receives the spines of the premaxillaries, its width $7\frac{1}{2}$ in head. Cranium posteriorly narrow, strongly convex transversely. Mouth rather small, oblique, the jaws subequal, the broad maxillary extending to below the middle of the eye, its length $2\frac{1}{6}$ in head. Supplemental maxillary well developed.

Teeth small, formed as in other *Epinephelı*, but with no canines in either jaw, not even rudimentary ones. Preopercle not serrated anywhere, its upper part with a few irregular crenations, its angle not salient, its emargination obsolete.

Opercle with a rudimentary spine, above which is a flat lobe. Opercular flap extending beyond the spine for a distance nearly equal to the diameter of the eye.

Gill-rakers shortish, about 13 on lower part of anterior arch. Nostrils small, round, close together, the posterior one the larger.

Scales small, cycloid, somewhat imbedded in the skin. Maxillary, preorbital, and tip of snout naked.

Dorsal spines low, strong, subequal, the longest 4 in head; soft dorsal elevated, the longest ray $2\frac{2}{10}$ in head. Caudal long, subtruncate, with rounded angles, $1\frac{3}{4}$ in head. Anal very high, rounded, its middle rays $2\frac{1}{4}$ in head. Anal spines short and strong, graduated, the second spine 5 in head. Pectorals short, not nearly reaching vent, $1\frac{2}{3}$ in head. Ventrals short, $2\frac{1}{5}$ in head.

Color in spirits dusky brown, mottled with darker. Head, body, and fins covered with rounded, whitish blotches, very irregular in form and size, none of them so large as the eye, these spots most distinct on the body. Head, breast, and branchiostegals thickly covered with smaller, round, dark spots, very distinct on the jaws and on the membrane of the maxillary. Top of head with some dark longitudinal streaks. Pectoral with small black spots. Other fins blackish, with pale spots like those on the body, but smaller.

This species is known only from three specimens, two of them now unfortunately destroyed, the third, from Socorro Island, now in the United States National Museum. From the latter the foregoing description was taken. The very close resemblance existing between *D. punc-*

tatus and *D. inermis* will be evident on comparison of the two descriptions.

LIST OF NOMINAL SPECIES, WITH IDENTIFICATIONS.

The following is a list of the nominal species referred to in the foregoing paper, arranged in chronological order, with our identification of each. Specific names which are valid are in *italics:*

Nominal species.	Year.	Identification.
Labrus *fulvus*, L	1758	Enneacentrus *fulvus*.
Perca punctata, L	1758	Enn. *fulvus* punctatus.
Perca *guttata*, L	1758	Enn. guttatus.
Perca *venenosa*, L	1758	Mycteroperca venenosa.
Perca *gigas*, Brünnich	1768	Epinephelus gigas.
Trachinus *ascensionis*, Osbeck	1771	Ep. ascensionis.
Perca punctulata, Gmelin	1788	Enn. fulvus punctatus.
Trachinus punctatus, Bonnaterre	1788	Ep. ascensionis.
Bodianus *apua*, Bloch	1790	Ep. apua.
Holocentrus *auratus*, Bloch	1792	Enn. fulvus.
Holocentrus punctatus, Bloch	1792	Ep. ascensionis.
Perca guttata, Bloch	1795	Enn. guttatus.
Perca maculata, Bloch	1795	Ep. ascensionis.
Perca punctata, Bloch	1795	Enn. fulvus ouatalibi.
Anthias *striatus*, Bloch	1795	Ep. striatus.
Epinephelus *afer*, Bloch	1795	Alphestes afer.
Johnius guttatus, Bloch & Schneider	1801	Myct. venenosa guttata.
Anthias cherna, Bloch & Schneider	1801	Ep. striatus.
Lutjanus lunulatus, Bloch & Schneider	1801	Ep. apua.
Bodianus marginatus, Bloch & Schneider	1801	Ep. apua.
Bodianus guativere, Bloch & Schneider	1801	Enn. fulvus
Gymnocephalus ruber, Bloch & Schneider	1801	Enn. fulvus ouatalibi.
Trachinus osbeck, Lacepède	1802	Ep. ascensionis.
Sparus cruentatus, Lac	1803	Enn guttatus.
Sparus atlanticus, Lac	1803	Ep. ascensionis.
Sparus chrysomelanurus, Lac	1803	Ep. striatus.
Holocentrus merou, Lac	1803	Ep. gigas.
Sparus *scirenga*, Rafinesque	1810	Myct. scirenga.
Serranus *itaiara*, Lichtenstein	1820	Promicrops itaiara.
Serranus *morio*, Cuv. & Val	1828	Ep. morio.
Serranus acutirostris, Cuv. & Val	1828	Myct. scirenga.
Serranus menzeli, Cuv. & Val	1828	Ep. gigas.
Serranus undulosus, Cuv. & Val	1828	Myct. scirenga.
Serranus *tæniops*, Cuv. & Val	1828	Enn. tæniops.
Serranus coronatus, Cuv. & Val	1828	Enn guttatus coronatus.
Serranus catus, Cuv. & Val	1828	Ep. apua.
Serranus nigriculus, Cuv. & Val	1828	Ep. ascensionis.
Serranus araiá, Cuv. & Val	1828	Ep. apua.
Serranus *cardinalis*, Cuv & Val	1828	Myct. venenosa guttata.
Serranus *niveatus*, Cuv. & Val	1828	Ep. niveatus.
Serranus ouatilibi, Cuv. & Val	1828	Enn. fulvus ouatalibi.
Serranus pixanga, Cuv. & Val	1828	Ep. ascensionis.
Serranus carauna, Cuv. & Val	1828	Enn. fulvus ouatalibi.
Plectropoma chloropterum, Cuv. & Val	1828	Alph. afer.
Serranus tinca, Cantraine	1831	Myct. scirenga.
Perca robusta, Couch	1832	Ep. gigas.
Serranus *inermis*, Cuv. & Val	1833	Dermatolepis inermis.
Serranus rupestris, Cuv. & Val	1833	Myct. venenosa guttata.
Serranus *tigris*, Cuv. & Val	1833	Myct. tigris.
Serranus marginatus, Lowe	1833	Ep. gigas.
Serranus fimbriatus, Lowe	1836	Ep. gigas.
Serranus fuscus, Lowe	1836	Myct. scirenga.
Serranus emarginatus, Val	1840	Myct. scirenga.
Serranus erythrogaster, De Kay	1842	Ep. morio.
Serranus *labriformis*, Jenyns	1842	Ep. labriformis.
Serranus *olfax*, Jenyns	1842	Myct. olfax.
Serranus galeus, M. & T	1842	Prom. itaiara.
Plectropoma *pictum*, Tschudi	1845	Alph. pictus.
Cerna macrogenis, Sassi	1846	Myct. scirenga.
Serranus impetiginosus, M. & T	1848	Ep. ascensionis.
Plectropoma monacanthus, M. & T	1848	Alph. afer.
Serranus *nigritus*, Holbrook	1859	Ep. nigritus.
Serranus margaritifer, Günther	1859	Ep. niveatus.
Serranus *mystacinus*, Poey	1851	Ep. mystacinus.
Serranus *interstitialis*, Poey	1860	Myct. interstitialis.
Serranus *dimidiatus*, Poey	1860	Myct. dimidiatus.
Serranus *bonaci*, Poey	1860	Myct. bonaci.
Serranus brunneus, Poey	1860	Myct. bonaci.
Serranus arará, Poey	1860	Myct. bonaci.
Serranus camelopardalis, Poey	1860	Myct. tigris camelopardalis.

Nominal species.	Year.	Identification.
Serranus felinus, Poey	1860	Myct. tigris.
Serranus rivulatus, Poey	1860	Myct. tigris camelopardalis.
Serranus repandus, Poey	1860	Myct. tigris.
Serranus petrosus, Poey	1860	Myct. venenosa.
Serranus decimalis, Poey	1860	Myct. bonaci.
Serranus *falcatus*, Poey	1860	Myct. falcata.
Serranus conspersus, Poey	1860	Ep. niveatus.
Serranus remotus, Poey	1860	Ep. morio.
Serranus guasa, Poey	1860	Prom. itaiara.
Serranus *dubius*, Poey	1860	Enn. dubius.
Serranus apiarius, Poey	1860	Enn. guttatus.
Serranus capreolus, Poey	1860	Ep. ascensionis.
Serranus cyclopomatus, Poey	1861	Myct. bonaci.
Serranus latepictus, Poey	1861	Myct. bonaci.
Dermatolepis punctatus, Gill	1861	Derm. punctatus.
Hyporthodus flavicauda, Gill	1861	Ep. niveatus.
Epinephelus *sellicauda*, Gill	1862	Ep. sellicauda.
Epinephelus *analogus*, Gill	1863	Ep. analogus.
Trisotropis reticulatus, Gill	1865	Myct. bonaci.
Plectropoma multiguttatum, Günther	1866	Alph. multiguttatus.
Serranus cernioides, Capello	1867	Ep. gigas.
Mycteroperca *calliura*, Poey	1867	Myct. calliurus.
Epinephelus flavolimbatus, Poey	1867	? Ep. niveatus,
Epinephelus cubanus, Poey	1867	Ep. apua.
Trisotropis aguaji, Poey	1868	Myct. bonaci.
Trisotropis chlorostomus, Poey	1868	? Myct. interstitialis.
Serranus varius, Bocourt	1868	Ep. ascensionis.
Serranus courtadré, Bocourt	1868	Ep. analogus.
Serranus quinquefasciatus, Bocourt	1868	Prom. itaiara *quinquefasciatus*.
Epinephelus chalinius, Cope	1871	Myct. scirenga.
Epinephelus ordinatus, Gill	1871	Ep. sellicauda.
Epinephelus brachysoma, Cope	1871	? Ep. gigas.
Serranus *panamensis*, Steindachner	1871	Enn. panamensis.
Menephorus punctiferus, Poey	1875	Enn. dubius.
Epinephelus *rosaceus*, Streets	1877	Myct. rosaceus.
Trisotropis *microlepis*, Goode & Bean	1878	Myct. microlepis.
Trisotropis stomias, Goode & Bean	1878	Myct. microlepis.
Mycteroperca falcata phenax, Jordan & Swain	1884	Myct. falcata phenax.
Mycteroperca bonaci *xanthosticta*, Jordan & Swain	1884	Myct. bonaci xanthostictus.

RECAPITULATION.

We have in this paper admitted thirty-five species of *Epinephelus* as occurring in American waters. More or less doubt is attached to the systematic position or nomenclature of several of these. We therefore repeat the list here, with an indication of the nature of the doubt remaining to be solved in each case. The general distribution of the species is indicated by the letters W, (Western Atlantic, West Indies, &c.), U (coasts of United States), A (Western Africa and Southern Europe), P (Eastern Pacific, Panama, &c.), G (western coast of South America, Peru, Galapagos Islands, &c.).

I.—Genus MYCTEROPERCA, Gill.

1. *M. rosacea*, Streets. (P.)
2. *M. falcata*, Poey. (W, U.)
   b. M. falcata phenax, Jordan & Swain. (U.)
3. *M. tigris*, Cuv. & Val. (W.)
   b. M. tigris camelopardalis, Poey. (Possibly a distinct species.)
4. *M. interstitialis*, Poey. (W.) (Possibly incorrectly identified; possibly includes two species, *chlorostomus* and *interstitialis*.)
5. *M. calliura*, Poey. (W.) (Unknown to us.)
6. *M. dimidiata*, Poey. (W.) (Doubtful species; unknown to us.)
7. *M. microlepis*, Goode & Bean. (W, U.)
8. *M. scirenga*, Raf. (W, A.) (Synonymy not verified by us; possibly more than one species included.)

9. *M. bonaci*, Poey. (W,U.) (Possibly more than one species included in the synonymy.
   b. M. bonaci xanthosticta, Jordan & Swain. (U.)
10. *M. reticulata*, Gill. (W.) (Possibly has some earlier name.)
11. *M. venenosa*, L. (W, U.) (Possibly two different species included.)
   b. M. venenosa guttata, Bloch & Schneider. (W.) (Possibly a valid species.)
12. *M. olfax*, Jenyns. (Species not well described.)

II.—Genus PROMICROPS, Gill.

13. *P. itaiara*, Lichtenstein. (W, U, P.)

III.—Genus EPINEPHELUS, Bloch.

14. *E. nigritus*, Holbrook. (Species imperfectly known.)
15. *E. morio*, Cuv. & Val. (W.)
16. *E. mystacinus*, Poey. (W.)
17. *E. striatus*, Bloch. (W.)
18. *E. sellicauda*, Gill. (P.)
19. *E. niveatus*, Cuv. & Val. (W.) (Possibly two species referred to the synonymy are really different—*margaritifer* and *flavolimbatus*.)
20. *E. labriformis*, Jenyns. (G.) (Insufficiently described.)
21. *E. gigas*, Brünnich. (A. W.) (Synonymy not verified by us; possibly the American species, *mentzeli*, is different.)
22. *E. drummond-hayi*, Goode & Bean. (W, U.)
23. *E. apua*, Bloch. (W, U.) (Possibly to be called *E. guttatus* or *E. catus;* possibly a different species, *cubanus*; included in the synonymy.)
24. *E. ascensionis*, Osbeck. (W, U.) (Possibly wrongly identified with Osbeck's *ascensionis;* in that case to be called *E. atlanticus*.)
25. *E. analogus*, Gill. (P.)

IV.—Genus ALPHESTES, Bloch & Schneider.

26. *A. pictus*, Tschudi. (G.) (Species imperfectly known.)
27. *A. multiguttatus*, Günther. (P.)
28. *A. afer*, Bloch. (W, A?)

V.—Genus ENNEACENTRUS, Gill.

(Possibly includes two or three distinct genera.)

29. *E. panamensis*, Steindachner. (P.)
30. *E. guttatus*, L. (W, U.) (Possibly includes two distinct species; perhaps should stand as *E. cruentatus*, instead of *E. guttatus;* type of a genus perhaps distinct—*Petrometopon*.
   b. E. guttatus coronatus, C. & V. (W, U.)
31. *E. tæniops*, Cuv. & Val. (W, A, U.)
32. *E. fulvus*, L. (W, U.) (Possibly, but very improbably, includes two distinct species, *punctatus* and *fulvus*.)
   b. E. fulvus ouatalibi, C. & V. (W, U.)
   c. E. fulvus punctatus, L. (W, U.)
33. *E. dubius*, Poey. (W.) (Possibly two species included, *dubius* and *punctifer*.)

VI.—Genus DERMATOLEPIS, Gill.

34. *D. inermis*, C. & V. (W.)
35. *D. punctatus*, Gill. (P.)

SYNOPSIS OF THE PLECTOGNATH FISHES.

By THEODORE GILL.

By common consent the fishes combined by Cuvier in 1817 under the ordinal designation Plectognathes have been retained as an order. Nevertheless, objection has been made against it by several ichthyologists, and it may be regarded as still an open question whether the group is entitled to ordinal distinction. In the latest general work on systematic ichthyology,* the "sixth order, Plectognathi," is thus characterized:

"Teleosteous fishes, with rough scales, or with ossifications of the cutis in the form of scutes or spines; skin sometimes entirely naked. Skeleton incompletely ossified, with the vertebræ in small number. Gills pectinate; a narrow gill opening in front of the pectoral fins. Mouth narrow; the bones of the upper jaw generally firmly united. A soft dorsal, belonging to the caudal portion of the vertebral column, opposite to the anal; sometimes elements of a spinous dorsal besides. Ventral fins, none, or reduced to spines. Air-bladder without pneumatic duct."

None of these features are exclusive to the Plectognathi or diagnostic of the group. The scales would not remove the representatives from the Acanthopterygious fishes; the vertebræ of *Psilocephalus* (*Anacanthus* Gthr.) and *Chonerhinus* (*Xenopterus* Gthr.) are more numerous than in a large proportion of the Acanthopterygians; the pectinate gills are shared with fishes generally; a "narrow gill opening" is found in fishes belonging to the same families (*e. g.*, Cottidæ and Blenniidæ) as those having wide gill openings; the mouth can scarcely be said to be narrow when it is coequal with the width of the wide-headed species, and, on the other hand, very many Acanthopterygious fishes have the mouth narrow; the bones of the upper jaw are at least as firmly united in various Acanthopterygians (*e. g.*, Teuthididæ, Siganidæ, Nemophididæ, &c.) and Malacopterygians (*e. g.*, some Characinidæ, Dalliidæ, &c.), as in the Plectognath Triacanthids and Balistids. The other characters are still less exclusive and more general.

Were such the only characters assignable to the "order Plectognathi," the group could not be retained. Nevertheless, most of the characters above given do really belong to the group in question, and they can be supplemented by characters of much more importance than those rehearsed, and are embodied in the following diagnosis:

* Günther's "Introduction to the Study of Fishes," p. 683. 1880.

PLECTOGNATHI.*

SYNONYMS AS ORDINAL NAMES.

= Les Plectognathes, *Cuvier*, Règne Animal, 1re éd., t. 1, p. 144, 1817.

< Plectognathi, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 193–195, 323–333, 1839. (Includes Plectognathi + Pediculati + Lophobranchii + Pegasus.)

> Gymnodontes (Pelvopteri), *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 39), 1832; Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840. †

> Sclerodermi (Acanthopteri), *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 39), 1832; Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840. †

= Plectognathes ou Echinoides, *Hollard*, Annales des Sc. Nat. (4), v. 13, pp. 5, 40, 46 1860.‡

> Balistidi, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 8, 1866; § Atlas Ich. des Indes Néerland., v. 5, p. 25, 1865.

> Ostracionidi, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 15, 1866; Atlas Ich. des Indes Néerland., v. 5, p. 85, 1865.

> Gymnodontidi, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 16, 1866; Atlas Ich. des Indes Néerland., v. 5, p. 43, 1865.

= Plectognathi-Hefthkeifer, *Haeckel*, Gen. Morphologie der Organismen, v. 3, p. cxxviii, 1866. (Zweite Ordnung der Physoclisten.)

= Plectognathi, *Cope*, Trans. Am. Phil. Soc., v. 14, pp. 456, 458, 1870; Proc. Am. Ass. Adv. Sc., v. 20, p. 340, 1872.

= Plectognathi, *Gill*, Arrangement Families of Fishes, p. 1, 1872.

= Gymnodontes,† *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 47, 1873.

Teleost fishes with the elements of the lower jaw consolidated in single pieces representing the two rami, the supramaxillaries and intermaxillaries more or less closely connected, the interoperculum detached from the other opercular bones, reduced and more or less rod-like in form, and the posttemporals suturally connected with the cranium.

These characters are certainly of more importance than those generally used to characterize the order, and, so far as known (except as to the upper jaw), are distinctive.‖ It is, however, quite possible that even they may fail and the order be abandoned. But the various representatives of the order are evidently related, and there is a regular grada-

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* Recherches sur la classification des poissons de l'ordre des Plectognathes. Par M. C. Dareste. < Ann. des Sc. Nat., 3e série, Zoologie, t. xiv, 1850.

† The "orders" *Gymnodontes* and *Sclerodermi* are combined by Bonaparte in a "section 3, Plectognathi."

‡ Mémoire sur le squelette des poissons Plectognathes, étudié au point de vue des caractères qu'il peut fournir pour la classification, lu à l'Académie des Sciences, le 9 avril 1860. Par M. H. Hollard, professeur à la faculté des sciences de Poitiers. < Ann. des Sci. Nat., 4e série, Zoologie, t. xiii, pp. 5–46, pl. 2, 3.

§ Systema Balistidorum, Ostracionidorum Gymnodontidorumque revisum. Petro Bleeker auctore. < Nederl. Tijdschr. Dierk., t. 3, pp. 8–19, 1866.

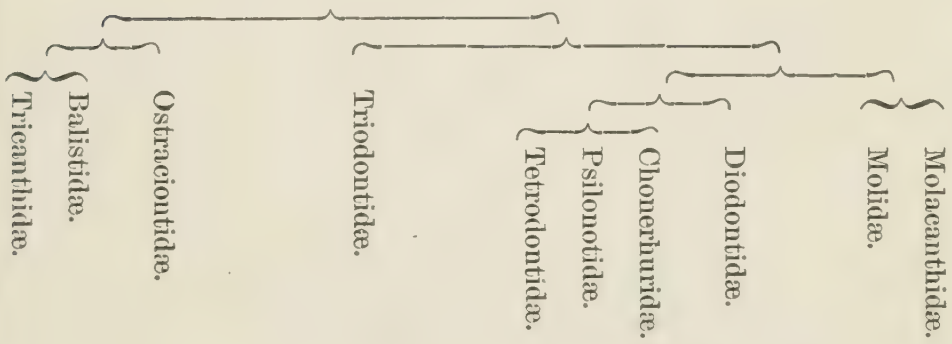
‖ Other forms have the supratemporals suturally attached.

tion from the teleosteoid to the most abnormal forms. The group will therefore stand, whatever may be the ultimate valuation of its characters by taxonomists. My conservative instincts impel me to retain the group with its generally recognized ordinal valuation. It is, it is true, of less taxonomic value than the Pediculates, the Apodes, or the Nematognaths, and of very much less importance than such orders as the Dipnoans, Crossopterygians, and Chondrosteans; but, on the other hand, its characters are of greater significance than such as are used for ordinal distinction in the class of birds, and therefore it may be well to keep it in the system till our knowledge of the whole is more ripe.

As to the affinities of the families, there is sufficient evidence to indicate their genetic relations tolerably well, and we have a regular series of gradations from the Triacanthidæ diverging in different directions. The ramifications of the group are indicated in the following tables, in which the left fork in each case indicates the most generalized form, and the right ones the successively more and more specialized forms.

TELEOCEPHALI.

(Teuthydoidea.)



I doubt not that objections will be made to an undue multiplication of families. When a comparison is made with their *characters* and those of generally accepted families in more familiar groups, their importance must be sooner or later acknowledged. It is to be hoped that naturalists may make use of their reasoning powers in considering them, and not *assume* that they are unjustifiable because previous students had not appreciated their value.

In conclusion, I have to make especial acknowledgment to the various memoirs on the Plectognaths published by Mr. Hollard. Had they not been neglected or practically ignored by his successors, a consistent system of the order would not have been deferred so long. The diagnoses have been made as brief as was consistent with clearness: the characters given are reinforced by others often as important, although not so patent as those used.

The families and subfamilies admitted by systematists at various times are indicated in the following table:

Families and subfamilies.	Dum., 1806.	Raf., 1810.	Cuv., 1817.	Bon., 1832.	Bon., 1850.	Adams, 1854.	Hol., 1857–'60.	Bl., 1859.	Bl., 1866.	Gill, 1872.
Triacanthidæ	.....	.....	.....	.....	.....	.....	.....	xiv[30]	85[30]	1
Triacanthodinæ	.....	.....	.....	.....	.....	.....	.....	.....	85[38]	(*)[44]
Triacanthinæ	.....	.....	.....	.....	.....	.....	46[17]	.....	85[39]	(*)[44]
Balistidæ	[105][1]	41[2]	149[5]	39	1	95	46[18]	xiv[31]	93[31]	1
Balistinæ	.....	.....	.....	.....	1[7]	.....	46[19]	.....	98[40]	(*)[44]
Monacanthinæ	.....	.....	.....	.....	1[8]	.....	46[20]	.....	99[41]	( )[44]
Psilocephalinæ	.....	.....	.....	.....	.....	.....	.....	.....	(*)[41]	.....
Ostraciontidæ	.....	39[3]	.....	.....	1[9]	95	46[21]	xiv[32]	25[42]	1
Ostraciontinæ	.....	.....	.....	.....	1[10]	.....	46[22]	.....	.....	.....
Triodontidæ	.....	.....	.....	.....	.....	.....	46[23]	xiv[33]	85[43]	1
Triodontinæ	.....	.....	.....	.....	.....	.....	46[24]	.....	.....	.....
Tetrodontidæ	[109][1]	40[4]	145[6]	39	1	95[15]	46[25]	xiv[34]	45[24]	1
Tetrodontinæ	.....	.....	.....	.....	1[11]	.....	46[26]	xiv[35]	49[45]	(*)[44]
Colomesinæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Psilonotidæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Psilonotinæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	( )[44]
Chonerhinidæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chonerhininæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	(*)[44]
Diodontidæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	(*)[44]
Diodontinæ	.....	.....	.....	.....	1[12]	.....	46[27]	xiv[36]	49[26]	.....
Molidæ	.....	.....	.....	.....	1[13]	95[16]	46[28]	xiv[37]	44[27]	1[45]
Molinæ	.....	.....	.....	.....	1[14]	.....	46[29]	.....	.....	.....
Molacanthidæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Molacanthinæ	.....	.....	.....	.....	.....	.....	.....	.....	.....	(*)[44]

[1] Although Duméril first introduced families into ichthyology, they were extremely artificial and based on Lacépède's ideas. *Balistes* (= Balistidæ + Triacanthidæ) was associated in one family (CHISMOPNES) with *Batrachus*, *Lophius*, and *Chimæra*, and *Ostracion*, *Tetraodon*, *Ovoides*, *Diodon*, and *Sphéroides* were grouped in another family (OSTÉODERMES) with *Syngnathus*. [2] Balistini (=Sclerodermi). [3] Ostracidi (=Ostracodermi). [4] Odontini (=Gymnodontes). [5] Sclérodermes. [6] Gymnodontes. [7] Balistini. [8] Monacanthini. [9] Ostracionidæ. [10] Ostracionini. [11] Tetraodontini. [12] Diodontini. [13] Orthagoriscidæ. [14] Molini and Orthagoriscini pt. [15] Gymnodontidæ. [16] Cephalidæ. [17] Balistides. [18] Triacanthiens. [19] Balistiens. [20] Monacanthiens. [21] Ostracionides. [22] Aracaniens + Ostraciens. [23] Loganiasomes on [24] Triodoniens. [25] Sphérosomes (Orbes epin). [26] Tétrodaniens. [27] Diodoniens. [28] Ellipsomes on [29] Orthagorisciens. [30] Triacanthoidei. [31] Balistoidei. [32] Ostracionoidei. [33] Triodontoidei. [34] Physogastroidei. [35] Tetrodontiformes. [36] Diodontiformes. [37] Orthagoriscoidei. [38] Paratriacanthiformes. [39] Triacanthiformes. [40] Balisteiformes. [41] Monacanthiformes with three phalanges—Monacanthini + Aluterini = Monacanthinæ Gill, and Psilocephalini = Psilocephalinæ Gill. [42] Ostracionoidei. [43] Tetrodontiformes with phalanges—Tetrodontini and Canthogastrini. [44] See synonymy of respective groups. [45] Orthagoriscidæ.

SCLERODERMI.

SYNONYMS AS FAMILIES.

< Sclérodermes, *Cuvier*, Mém. Mus. d'Hist. Nat., t. 1, pp 132 (120-121), 1815.
< Sclérodermes, *Cuvier*, Règne Animal [1e éd.], t. 2, p. 149, 1817; [2e éd.], t. 2, p. 371, 1820.
< Sclerodermi, *Günther*, Cat. Fishes in Brit. Mus., v. 8, p. 207, 1870.

SYNONYMS AS SUBORDERS.

< Sclérodermes, *Hollard*, Annales des Sci. Nat. (4), v. 13, pp. 31, 46, 1860.
= Sclerodermi, *Gill*, Arrangement Families Fishes, pp. xli, 1, 1872.
= Sclerodermata, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 46, 1873.

SYNONYMS AS ORDERS.

<Sclerodermi, *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832.
=Balistides, *Bleeker*, Enum. Sp. Pisc. Archip. Indico, p. xiv, 1859.
=Les Balistes, *Bleeker*, Atlas Ich. des Indies Néerland., t. 5, p. 85, 1865.
=Balistidi, *Bleeker*, Ned. Tijdschr. Dierk., v. 3, p. 8, 1866.

Plectognathi with a spinous dorsal or single spine just behind or over the cranium, with a normal pisciform shape, scales of regular form or more or less spinigerous, and distinct teeth in the jaws.

TRIACANTHIDÆ.

SYNONYMY.

<Sclérodermes, *Cuvier*, Règne Animal, 1e. éd., t. 2, p. 149, 1817; 2e éd., t. 2, p. 371, 1829.
=Balistidæ, *Nardo*, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 70 (1842), 1884.
=Triacanthoidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xiv, 1859; Atlas Ich. des Indes Néerland., t. 5, p. 85, 1865.
<Sclerodermi, *Günther*, Cat. Fishes Brit. Mus., v. 8, p. 207, 1870.
=Triacanthidæ, *Cope*, Trans. Am. Phil. Soc., v. 14, p. 458, 1870; Proc. Am. Assoc. Adv. Sci., v. 20, p. 340, 1872.
=Triacanthoidei, *Bleeker*, Ned. Tijdschr. Dierk., v. 3, p. 8, 1866.
Balistæ sp., *Fitzinger*, 1873.

Scleroderms with a pair of large ventral spines normally articulating with the pelvic bones, and with rounded scales, more or less spinigerous.

TRIACANTHODINÆ.

SYNONYMY.

=Triacanthodinæ, *Gill*, Proc. Acad. Nat. Sc., Phila. 1862, p. 235, 1862.
=Paratriacanthiformes, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 9, 1866; Atlas Ich. des Indes Néerland., v. 5, p. 85, 1865.

Triacanthidæ with conical teeth in both jaws and a short oblong caudal peduncle.

Two genera are known, *Triacanthodes* (Bleeker), with two rows of teeth, and *Hollardia* (Poey), with a single row in each jaw.

TRIACANTHINÆ.

SYNONYMY.

<Triacanthiens, *Hollard*, Annales Sc. Nat. (4), v. 13, p. 46, 1860.
=Triacanthiformes, *Bleeker*, Nederl. Tijdschr. Dierk., v. 9, p. 9, 1866; Atlas des Indes Néerland., v. 5, p. 85, 1865.
<Triacanthini, *Poey*, Repertorio Fis. Nat. de Cuba, v. 2, p. 210, 1868.

Triacanthidæ with incisorial teeth in both jaws ($\frac{1}{1}\frac{0}{0}$), and with a long, narrowed caudal peduncle.

Triacanthus, the only known genus, has a short inner row of rounded teeth in each jaw.

BALISTIDÆ.*

SYNONYMY.

> Balistini, *Rafinesque*, Indice d'Ittiolog. Siciliana, p. 41 (58. ord.), 1810.
< Balistides, *Risso*, Hist. Nat. de l'Europe Mérid., t. 3, p.—, 1827 (= Sclérodermes).
< Acanthopteres, *Blainville*, Journ. de Physique, 1816.
< Sclérodermes, *Cuvier*, Regne Animal, 1e éd., t. 2, p. 149, 1817, 2e éd., t. 2, p. 371, 1829.
< Balistidi, *Bonaparte*, Fauna Italica, v. 3, Pesci, fol.
< Balistidæ, *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali. Vertebr. a Sangue Freddo), p. 39, 1832.
< Balistididæ, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840.
< Balistidæ, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 193, 323, 1839.
< Balistina, *MacLeay*, Calcutta Journ. Nat. Hist., 1841.
= Balistidæ, *Nardo*, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 70, (1842), 1844.
< Quatrième famille [des Plectognathes], *Dareste*, Ann. Sc. Nat. (3), v. 14, p. 126, 1850,
< Balistidæ, *Adams*, Manual Nat. Hist., p. 95, 1854.
< Balistides, *Hollard*, Ann. Sc. Nat. (3), v. 20, pp. 77, 113, 1853; (4), v. 13, p. 23, 1860.
< Balistidæ, *Girard*, Expl. and Surv. for R. R. Route to Pacific Oc., v. 10, Fishes, p. 338, 1858.
= Balisteoidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xiv, 1859; Atlas Ich. des Indes Néerland., t. 5, p. 93, 1865; Ned. Tijdschr. Dierk., v. 3, p. 9, 1866.
< Sclerodermi, *Günther*, Cat. Fishes Brit. Mus., v. 8, p. 207, 1870.
= Balistidæ, *Cope*, Proc. Am. Assoc. Adv. Sci., v. 20. p. 340, 1872.
> Balistæ, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 47, 1873.
> Aluteræ, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1 Abth., p. 47, 1873.
= Balistidæ, *Jordan & Gilbert*, Syn. Fishes N. Am., pp. 852, 854, 1882.

Scleroderms without paired ventrals or spines, and with reduced rhombiform or more or less spiniform dorsal appendages.

BALISTINÆ.

SYNONYMY.

= Balistia, *Rafinesque*, Analyse de la Nature, p. —, 1815.
< Balistinæ, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 194, 324, 1839.
< Balistidini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840.
= Balistini, *Nardo*, Atti Congressi Scienze Ital. rac. et ord., v. 1, p. 70 (1842), 1844.
< Balistini, *Bonaparte*, Catal. Metod. Pesci Europei, p. 8, 1846.
= Balistiens, *Hollard*, Annales des Sci. Nat. (4), t. 13 (p. 7), p. 46, 1860.
= Balistinæ, *Gill*, Cat. Fishes E. Coast N. Am., p. 56, 1861.
= Balisteiformes, *Bleeker*, Atlas Ich. des Indes Néerland., t. 5, p. 98, 1865.
= Balistidiformes, *Bleeker*, Ned. Tijdschr. Dierk., v. 3, p. 9, 1866.
< Balistina, *Günther*, Cat. Fishes Brit. Mus., v. 8, pp. 208, 211, 1870.
= Balistinæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 854, 1883.

Balistidæ with vertebræ in small number (17=7+10), an anterior dorsal consisting of 3 (or 2) spines, of which the first is enlarged and

* Monographie de la famille des *Balistides*, par M. Hollard. Travail lu à l'Académie des Sciences le 4 août 1851. <Annales des Sci. Nat., 3e série, Zoologie, tome xx, pp. 71–114, pl. 1, 2, 3; 4e série, Zoologie, tome i, pp. 39–72, pl. 2, 3, pp. 303–339, pl. 5; tome ii, pp. 321–366, pl. 12. 13, 14; tome iv, pp. 5–27, pl. 1.

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the second locks it in erection, and the branchial apertures behind or under the eyes.

MONACANTHINÆ.

SYNONYMY.

<Monacanthini, *Nardo*, Atti Congressi Scienze Ital. rac. et ord., v. 1, p. 70 (1842), 1844.
<Monacanthini, *Bonaparte*, Catal. Metod. Pesci Europei, p. 8, 1846.
<Monacanthiens, *Hollard*, Annales des Sci. Nat. (4), t. 13, p. (19,) 46, 1860.
=Monacanthinæ, *Gill*, Cat. Fishes E. Coast N. Am., p. 56, 1861.
<Monacanthiformes, *Bleeker*, Atlas Ich. des Indes Néerland., t. 5, p. 99, 1865.
<Monacanthiformes, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 11, 1866.
=Monacanthinæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 854, 1883.
Balistina gen., *Günther*.

Balistidæ with the vertebræ in small number (18—21=7+11—14), the anterior dorsal represented by a comparatively slender spine, behind which is at most a rudimentary one, and the branchial apertures behind or under the eyes.

PSILOCEPHALINÆ.

SYNONYMY.

<Monacanthiformes (=Phalanx Psilocephalini), *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 11 (14), 1866; Atlas Ich. des Indes Néerland., v. 5, pp. 99, 100, 1865.

Balistidæ with the vertebræ in increased number (29–30), the anterior dorsal represented by a feeble spine over the frontal region, and the branchial apertures in advance of the eyes.

OSTRACODERMI.

SYNONYMS AS FAMILY NAMES.

<Sclérodermes, *Cuvier*, Règne Animal. 1e éd., v. 2, p. 149, 1817; 2e éd., v, 2, p. 375, 1829.
<Sclerodermi, *Günther*, Cat. Fishes in Brit. Mus., v. 8, p. 207, 1870.

SYNONYMS AS SUBORDERS.

<Sclérodermes, *Hollard*, Annales des Sci. Nat. (4), v. 8, p. 275, 1857; v. 13, p. 31, 1860.
=Ostracodermi, *Gill*, Arrangement Families of Fishes, pp. xii, 1, 1872.
=Cataphracti, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 47, 1873.
=Ostracodermi, *Goode*, Proc. U. S. Nat. Mus., v. 2, p. 268, 1880.

SYNONYMS AS ORDINAL NAMES.

<Sclerodermi, *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39), 1832.
=Ostraciones, *Bleeker*, Enum. Sp. Pisc. Archip. Indico, p. xiv, 1859; Atlas Ich. des Indes Néerland, v. 5, p. 25, 1865.
=Ostracionidi, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 15, 1866.

Plectognaths without a spinous dorsal, with the body inclosed in an angular box formed by polygonal scutes joined at their edges, and with distinct teeth in the jaws.

OSTRACIONTIDÆ.*

SYNONYMS AS FAMILY NAMES.

=Ostracidi, *Rafinesque*, Indice d'Ittiolog. Siciliana, p. 39 (50. ord.), 1810.
=Ostraciontidæ, *Nardo*, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 70 (1842), 1844.
=Cinquième famille [des Plectognathes], *Dareste*, Ann. Sc. Nat. (3), v. 14, p. 131, 1850.
=Ostraciones, *Bleeker*, Bijdr. tot der Kennis Balist. en Ostraciones van dem Ind. Archipel., pp. 28–36, 1852.
=Ostraciontidæ, *Adams*, Manual Nat. Hist., p. 95, 1854.
=Ostracionidæ, *Kaup*, Archiv für Naturg., Jahrg., v. 1, pp. 215–221, 1855.
=Ostracionides, *Hollard*, Ann. Sc. Nat., Zool. (3), v. 7, p. 121, 1856; (4), v. 13, pp. 26, 46, 1860.
=Ostracionoidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xiv, 1859; Atlas Ich. des Indes Néerland., t. 5, p. 25, 1865; Nederl. Tijdschr. Dierk., v. 3, p. 15, 1866.
=Ostraciontidæ, *Cope*, Trans. Am. Phil. Soc., v. 14, p. 458, 1870.
=Ostraciidæ, *Cope*, Proc. Am. Assoc. Adv. Sci., v. 20, p. 340, 1872.
=Ostraciontidæ, *Gill*, Arrangement Fam. of Fishes, p. 1, 1872.
=Ostraciontes, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 47, 1873.
=Ostraciontidæ, *Goode*, Proc. U. S. Nat. Mus., v. 2, p. 269, 1880.
=Ostraciidæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 852, 1882.

SYNONYMS AS SUBFAMILY NAMES.

=Ostracidia, *Rafinesque*, Analyse de la Nature, p. —, 1815.
=Ostraciontini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840; Consp. Syst. Ich., 1850.
=Ostracinæ, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 193, 323, 1839.
=Ostraciontini, *Nardo*, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 71 (1842), 1844.
>Ostraciens, *Hollard*, Ann. Sc. Nat., Zool. (4), v. 13, p. 46, 1860.
>Aracaniens, *Hollard*, Ann. Sc. Nat., Zool. (4), v. 13, p. 46, 1860.
=Ostraciontina, *Günther*, Cat. Fishes Brit. Mus., v. 8, pp. 208, 255, 1870.

The only family of the suborder.

GYMNODONTES.

SYNONYMS AS FAMILIES.

=Gymnodontes, *Cuvier*, Règne Animal, 1e éd., t. 2, p. 145, 1817; 2e éd., t. 2, p. 364, 1829.
=Gymnodontes, *Günther*, Cat. Fishes in Brit. Mus., v. 8, pp. 207, 269, 1870.

SYNONYM AS SUBORDER.

=Gymnodontes, *Hollard*, Annales des Sci. Nat. (4), t. 8, pp. 275–328, 1857.†
=Gymnodontes, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 47, 1873.

* Monographie de la famille des *Ostracionides*, par H. Hollard, professeur à la faculté des sciences de Poitiers. Travail présenté à l'Académie des Sciences dans sa séance du 27 octobre 1856. <Annales des Sci. Nat., 5e série, Zoologie, tome vii (1857), pp. 121–170, pl. 13.

† Études sur les Gymnodontes et en particulier sur leur ostéologie et sur les indications qu'elle peut fournir pour leur classification, par M. H. Hollard, professeur à la Faculté des Sciences de Poitiers. <Ann. des Sci. Nat., 4e série, Zoologie, t. 8, pp. 273–328, pl. 5, 6, 1857.

SYNONYMS AS ORDERS.

=Gymnodontes, *Bonaparte*. Giorn. Arcad. di Scienze, t. 52 (Saggio Distrib. Metod. Animal Vertebr. a Sangue Freddo, p. 39), 1832.
=Pachydontes, *Bleeker*, Enum. Sp. Pisc. Archip. Indico, p. xiv, 1859.
=Gymnodontes, *Bleeker*, Atlas Ich. des Indes Néerland., t. 5, p. 43, 1865.
=Gymnodontidi, *Bleeker*, Nederl. Tijdschr. Dierk., v. 3, p. 16, 1866.

Plectognaths without a spinous dorsal, with the body more or less sacciform, the scales typically spiniform and with root-like insertions, (archætypically rhomboid), and with the jaws enveloped in an enamel-like covering, and without distinct teeth.

TRIODONTOIDEA.

SYNONYM.

Triodontoidea, *Gill*, n. superfam.

Gymnodontes with a movable pelvic apparatus, well-developed ribs, a normally developed caudal region, the upper jaw with a median suture, and the lower jaw subdivided.

TRIODONTIDÆ.

FAMILY SYNONYMS.

=Deuxième famille [des Plectognathes], *Dareste*, Ann. Sc. Nat. (3), v. 14, p. 122, 1850.
=Loganiosomes, *Hollard*, Ann. Sc. Nat. (4), Zool., v. 13, pp. (33), 46, 1860.
=Triodontoidei, *Bleeker*, Ich. Atlas des Indes Néerland., v. 5, p. 83, 1865; Nederl. Tijdschr. Dierk., v. 3, p. 19, 1866.
=Triodontidæ, *Gill*, Arrangement Fam. of Fishes, p. 1, 1872.
=Triodontes, *Fitzinger*, Sitzungsber. K. Acad. der Wissensch. (Wien), B. 67, 1, Abth., p. 47, 1873.

SUBFAMILY SYNONYM.

=Triodoniens, *Hollard*, Ann. Sc. Nat. (4), Zool., v. 13, p. 46, 1860.

The only family of the superfamily.

TETRODONTOIDEA.

SYNONYMY.

<Tetrodontoidea, *Gill*, Cat. Fishes E. Coast N. Am., p. 1, 1873.

Gymnodontes without either pelvis or ribs, with a normally developed caudal region, with the intermaxillary and dentary bones severally connected by suture at middle, the supramaxillaries curved outwards behind the intermaxillaries, the ethmoid more or less projecting in front of the frontals, and the postfrontals extended outwards as far at least as the frontals.

TETRODONTIDÆ.

SYNONYMY.

<Odontini, *Rafinesque*, Indice d'Ittiolog. Siciliana, p. 40, 1810.
<Odopsia, *Rafinesque*, Analyse de la Nature, p. —, 1815.
<Gymnodontes, *Cuvier*, Règne Animal, 1e éd., t. 2, p. 145, 1817; 2d éd., t. 2, p. 364, 1829.
<Tetraodontidæ, *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Verteb. a Sangue Freddo, p. 39), 1832.
<Tetraodontidæ, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840.
<Première famille [des Plectognathes], *Dareste*, Ann. Sc. Nat. (3), v. 14, p. 117, 1850.
<Gymnodontidæ, *Adams*, Manual Nat. Hist., p. 95, 1854.
=Tetraodoniens, *Bibron*, Revue et Mag. Zool., t. —, p. 279, 1855.
<Gymnodontidæ, *Girard*, Expl. and Surv. for R. R. Route to Pacific Oc., v. 10, Fishes, p. 339, 1858.
<Phycogastroidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xiv, 1859.
>Sphérosomes, *Hollard*, Annales des Sci. Nat. (4), t. 8, p. 326, 1860.
>Tetraodontoidei, *Bleeker*, Atlas Ich. des Indes Néerland, t. 5, p. 45, 1865; Nederl. Tijdschr. Dierk., v. 3, p. 17, 1866.
=Tetrodontidæ, *Cope*, Proc. Am. Assoc. Adv. Sci., v. 20, p. 340, 1872.
<Tetrodontidæ, *Gill*, Arrangement Fam. of Fishes, p. 1, 1872.
=Tetrodontes, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 47, 1873.
<Tetrodontidæ, *Jordan & Gilbert*, Syn. Fishes N. Am., pp. 853, 859, 1883.

Tetrodontoidea with the frontals articulated with the supraoccipital and the postfrontals confined to the sides, the ethmoid little prominent to view above and short or narrow, the vertebræ in small number (7, 8 + 9 — 13), the head wide and with a heavy wide snout, and the dorsal and anal fins short and pauciradiate.

TETRODONTINÆ.

SYNONYMS AS SUBFAMILY-NAMES.

<Tetraodontini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840.
<Tetraodinæ, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 194, 328, 1839.
<Tetrodontiformes, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xiv, 1859.
<Tetrodoniens, *Hollard*, Annales des Sci. Nat. (4), t. 8, p. 327, 1860.
<Tetraodontiformes, phalanx A. Tetraodontini, *Bleeker*, Atlas Ichthyol. Indes Orient. Néerland., v. 5, p. 49, 1865; Nederl. Tijdschr. Dierk., v. 3, p. 18, 1866.
<Tetrodontina, *Günther*, Cat. Fishes Brit. Mus., v. 8, pp. 269, 270, 1870.
<Tetrodontinæ, *Gill*, Johnson's New Univ. Cycl., v. 4, p. 792, 1877.
<Tetrodontinæ, *Jordan and Gilbert*, Syn. Fishes N. Am., p. 859, 1883.

Tetrodontidæ with the frontals expanded sideways and forming the lateral roofs of the orbits, the postfrontals limited to the posterior portions.

As the name *Tetrodon* has been variously employed, the essentials of its early history may be in place here.

Linnæus, in the tenth edition of the "Systema Naturæ", in which the binomial system was first universally applied, accepted the genus *Tetro-*

don with six species, as follows, the names under which they were retained in the last systematic work on fishes—Günther's Catalogue of the Fishes in the British Museum being added:

1. *testudineus*,	332,	*T.* (*Cheilichthys*) *testudineus*, G. viii, 282.
2. *lagocephalus*,	332,	*T.* (*Gastrophysus*) *lagocephalus*, G. viii, 273.
3. *lineatus*,	333,	*T.* (*Arothron*) *fahaka*, G. viii, 290.
4. *ocellatus*,	333,	*T.* (*Gastrophysus*) *ocellatus*, G. viii, 279.
5. *hispidus*,	333,	*T.* (*Arothron*) *hispidus*, G. viii, 297.
6. *mola*,	334,	*Orthagoriscus mola*, G. viii, 317.

No species having been signalized as the type of the genus, it remained for succeeding naturalists to restrict the names to a more definite group.

The *T. mola* was first removed as the type of the genus *Mola* by Cuvier in 1798.

The remaining species were left together till W. Swainson,* in 1839, subdivided the genus, and named five sections distinguished by trivial characters, but which, nevertheless, must be taken cognizance of.

These were named and defined at p. 328 of v. 2 as follows:

Tetraodon Linn.—Head short; the body being entirely covered with prickles.

T. lineatus. Bloch, 141.†	*T.* (*Arothron*) *stellatus*, G. viii, 294.
testudineus. Ib. 139.‡	*T.* (*Arothron*) *reticularis*, G. viii, 296.†
maculatus. Hamilt. 18, fig. 2.	*T.* (*Chelonodon*) *patoca*, G. viii, 288.
fluviatilis. Ib. pl. 30, fig. 1.	*T.* (*Arothron*) *fluviatilis*, G. viii, 299.

Leisomus Sw.—Head short; the body entirely smooth.

T. lævissimus. Sch.§

marmoratus. Hamilt. pl. 18, fig. 3. *T.* (*Monotretus*) *cutcutia*, G. viii, 290.

Lagocephalus Sw.—Head short; the upper parts of the body smooth; the belly armed with angulated spines, as in *Diodon.*

L. stellatus. Bl. pl. 143.	*T.* (*Gastrophysus*) *Honckenii*, G. viii, 276.
Pennantii. Yarrell, ii. 347.	*T.* (*Gastrophysus*) *lagocephalus*, G. viii, 273.

Cirrhisomus Sw.—Sides of the body furnished with cirriform processes.

C. Spengleri. Bloch, pl. 144.	*T.* (*Cheilichthys*) *Spengleri*, G. viii, 284.

Psilonotus Sw.—Fore part of the head and muzzle prolonged, narrow, as in *Balistes;* the back carinated; belly furnished with prickles.

P. rostratus. Bl. pl. 146.	*T.* (*Anosmius*) *rostratus*, G. viii, 303.
electricus. Ph. Tr. 76, pl. 3.	*T.* (*Anosmius*) *margaritatus*, G. viii, 300.

It is necessary to add that the author, on a previous page (v. 2, p. 194), had defined the same groups in essentially the same manner, but

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*On the Natural History and Classification of Fishes, Amphibians, and Reptiles, by William Swainson, v. 2, pp. 194, 328.

†Not identical but congeneric with *T. lineatus*, L., = *T.* (*Arothron*) *fahaka*, G. viii, 290.

‡Generically distinct from *T. testudineus*, L., = *T.* (*Cheilichthys*) *testudineus*, G. viii, 282.

§There is no "*T. lævissimus*" in Bloch and Schneider's "Systema Ichthyologiæ," and Swainson has simply copied the name from Règne Animal of Cuvier, who, in his second section of the genus *Tetraodon*, characterized by the entire body smooth, groups two species: "*T. lævissimus*, Bl., Schn."; and "*T. cutcutia*, Buchan, xiii, 3". The first species is unidentifiable, unless it be with the *T. lævigatus*, Bl., Schn.

in two cases under different names, without, however, specifying the types, viz:

Tetrodon, 194.	Tetrodon, 328.
Leiodon, 194.	*Leisomus*, 328.
Lagocephalus, 194.	Lagocephalus, 328.
Cirrhisomus, 194.	Cirrhisomus, 328.
Canthigaster, 194.	*Psilonotus*, 328.

Dr. Bleeker has preferred to take the first names, but it would have been absolutely impossible to have identified these types with certainty had not some species been enumerated under them, and we may therefore regard them as determinable only from the last mention of them; this is fortunate, because the names finally given were much better than those first used.

Inasmuch as the name *Tetrodon* was thus restricted to a group of which two *Linnæan* species are representatives (although Swainson's references did not represent the species), it must be retained for them and their allies, and the subsequently given name *Arothron*, as well as the still later terms for congeneric species, must be relegated to its synonymy.

The genera *Lagocephalus*, *Liosomus*, *Cirrhosomus* and *Psilonotus* may then be retained for the species enumerated under them by Swainson and for related ones.

COLOMESINÆ.

SYNONYMY.

=Colomesinæ, *Gill*, n. subf.
Tetrodontinæ sp. *auct.*

Tetrodontidæ with the frontals narrowed and excluded from the orbits, the postfrontals being elongated and projected forward and connected with the prefrontals!

This subfamily is established for the genus *Batrachops* of Bibron and Hollard,* founded on a species identified with the "*Tetr. psittacus* Bl. Schn., ou *Tetr. perroquet* de Lacépède." The name *Batrachops* had been preoccupied for another genus of fishes by Heckel, and *Colomesus* is used as a substitute.†

PSILONOTIDÆ.

SYNONYM AS SUBFAMILY.

=Tetraodontiformes phalanx Canthogastrini, *Bleeker*, Atlas Ich. des Indes Néerland., v. 5, p. 49, 1865; Nederl. Tijdschr. Dierk., v. 3, pp. 18, 19, 1866.
=Psilonotinæ, *Gill*, Johnson's Univ. Cyclopædia, v. 4, p. 792, 1878.

Tetrodontoidea with the frontals separated from the supraoccipital by the intervention of the postfrontals, which are connected together

* Batrachops *Hollard* Annales des Sc. Nat. (4), v. 8, p. 321, pl. 6, f. 3, 1857.
† *Κολος*, defective, *μεσος*, middle.

and laterally expanded but short, the ethmoid prominent above, enlarged and narrowed forwards, the vertebræ in normal number (about 8+9), the head compressed and with a projecting attenuated snout, and the dorsal and anal fins short and pauciradiate.

CHONERHINIDÆ.

SYNONYMY.

=Xenopterinæ, *Gill*, Johnson's Univ. Cyclopædia, v. 4, p. 792, 1878.

Tetrodontoidea with the frontals separated from the supraoccipital by the intervention of the postfrontals, which are much enlarged and assume a quadrangular form, the ethmoid little prominent to view and very short, the vertebræ in increased number (12+17), the head wide and with a blunt wide snout, and the dorsal and anal fins long and multiradiate (D 32—38; A 28—32).

DIODONTOIDEA.

Gymnodontes without a pelvis, with a normally developed caudal region, with the intermaxillary and dentary bones coössified into single sutureless arches, the supramaxillary portions extended laterally behind, the ethmoid retracted backwards under the frontals, and the postfrontals retracted inwards to the sides of the supraoccipital and behind the frontals.

DIODONTIDÆ.

SYNONYMS AS FAMILY NAMES.

<Odontini, *Rafinesque*, Indice d'Ittiolog. Siciliana, p. 40, 1810.
<Gymnodontes, *Risso*, Hist. Nat. de l'Europe Mérid., t. 3, p. 102, 1826.
<Gymnodontes, *Cuvier*, Règne Animal, 1re éd., t. 2, p. 145, 1817; 2e éd., t. 2, p. 364, 1829.
<Gymnodontidæ, *Adams*, Manual Nat. Hist., p. 95, 1854.
<Diodoniens, *Bibron*, Revue et Mag. de Zool., v. —, p. —, 1855.
<Gymnodontes, *Günther*, Cat. Fishes Brit. Mus., v. 8, p. 269, 1870.
≐Diodontidæ, *Cope*, Trans. Am. Phil. Soc., v. 14, p. 458, 1870; Proc. Am. Assoc. Adv. Sci., v. 20, p. 340, 1872.
=Diodontes, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 48, 1873.
=Diodontidæ, *Gill*, Cat. Fishes, E. Coast N. Am., p. 6, 1873.

SYNONYMS AS SUBFAMILY NAMES.

<Odopsia, *Rafinesque*, Analyse de la Nature, 2 subf. of 22 fam., p. —, 1815.
=Diodontini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 131, 1838; t. 4, p. 186, 1840.
=Diodontini, *Nardo*, Atti Congressi Scienz. Ital. rac. et ord., v. 1, p. 71 (1842), 1844.
<Diodoninæ, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 194, 329, 1839.
=Diodoniens, *Hollard*, Annales Sc. Nat., Zool. (4), v. 8, p. 313, 1857; (4,) v. 13, p. 46, 1860.
=Diodontiformes, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xiv, 1859; Atlas Ich. des Indes Néerland., t. 5, p. 49, 1865; Nederl. Tijdschr. Dierk., v. 3, p. 17, 1866.
<Tetrodontina, *Günther*, Cat. Fishes Brit. Mus., v. 8, pp. 208, 255, 1870.
=Diodontinæ, *Jordan & Gilbert*, Syn. Fishes N Am., p. 859, 1883.

The only family of the superfamily.

MOLOIDEA.

Gymnodontes without a pelvis or ribs, with the caudal region aborted and the body truncated behind, and with the jaws destitute of median sutures.

MOLIDÆ.

SYNONYMS AS FAMILY NAMES.

=Molæ, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.
=Orthragoriscidæ, *Bonaparte*, Nuovi Annali delle Sci. Nat., v. 2, p. 131, 1838; v. 4, p. 187, 1840.
=Orthagoriscidæ, *MacLeay*, Journ. Asiat. Soc. Bengal, v. —, p. —, 1841.
<Troisième famille [des Plectognathes], *Dareste*, Ann. Sc. Nat. (3), v. 14, p. 125, 1850.
<Cephalidæ, *Adams*, Manual Nat. Hist., p. 95, 1854.
=Ellipsomes, *Hollard*, Annales des Sci. Nat. (4), v. 13, p. 46, 1860.
=Orthagoriscoidei, *Bleeker*, Enum. Sp. Piscium Archip. Indico, p. xiv, 1859; Atlas Ich. des Indes Néerland., v. 5, p. 44, 1865; Nederl. Tijdschr. Dierk., v. 3, p. 16, 1866.
=Orthagoriscidæ, *Gill*, Arrangement Fam. of Fishes, p. 1, 1872.
=Orthagorisci, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), v. 67, 1. Abth., p. 48, 1873.
<Orthagoriscidæ, *Jordan & Gilbert*, Syn. Fishes N. Am., pp. 852, 864, 1883.

SYNONYMS AS SUBFAMILY NAMES.

*>Orthragoriscini, *Bonaparte*, Nuovi Annali della Sci. Nat., 1838; v. 4, p. 187, 1840.
×Molini, *Bonaparte*, Nuovi Annali della Sci. Nat., 1838; v. 4, p. 187, 1840.
<Cephalinæ, *Swainson*, Nat. Hist. Class. Fishes, etc., v. 2, pp. 195, 329, 1839.
×Molini, *Bonaparte*, Cat. Metod. Pesci Europei, p. 87, v. 1, p. 199, 1846.
>Orthragoriscini, *Bonaparte*, Cat. Metod. Pesci Europei, p. 87, v. 1, p. 199; 1846.
=Orthagoriscinæ, *Gill*, Cat. Fishes East Coast N. A., p. 57, 1861.
<Molina, *Günther*, Cat. Fishes Brit. Mus., v. 8, pp. 269, 317, 1870.

Moloidea with a moderately compressed oblong body (longer than high), with a posterior marginal or caudal fin intervening between the dorsal and anal and with corresponding interspinal bones (at least 4 or 5 above and 8 or 9 below in the adult) connected with the posterior surfaces of the neural and hæmal spines of the last complete (typically 16th) vertebra.

There are three well-marked genera of this type.

MOLA.

SYNONYMY.

<Mola, *Cuvier*, Tableau Élém. Hist. Nat. Animaux, p. 323, 1798.
<Orthragoriscus, *Bloch*, Systema Ichthyologiæ, Schneider ed., p. 510, 1801.
<Cephalus, *Shaw*, General Zoology, v. 2, p. 432, 1804.
×Diplanchias, *Rafinesque*, Caratt. Alc. Nuov. Gen. e Nuov. Sp. Anim. e Piante della Sicilia, p. 17, 1810.

* The two subfamilies admitted by Bonaparte in the family "Orthragoriscidæ" were defined as follows:

"*Orthragoriscini*. Sceletum omnino cartilagineum; pinnæ cute communi tectæ."

"*Molini*. Sceletum sub-osseum; pinnæ cute peculiari tectæ."

Molacanthus as well as *Mola* were referred to the Molini; *Orthragoriscus* Bon. (=*Ranzania* Nardo) alone to the "Orthragoriscini."

× Orthragus, *Rafinesque*, Caratt. Alc. Nuov. Gen. e Nuov. Sp. Anim. e Piante della Sicilia, p. 17, 1810.
× Cephalus, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.*
× Tympanomium, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.*
× Diplanchias, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.*
× Trematopsis, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.*
× Orthragoriscus, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.*
× Ozodura, *Ranzani*, Novi Comm. Acad. Scient. Bonon., v. 3, tab. after p. 81, 1837.*
× Pedalion, *Guilding* MSS., *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 1, p. 199; v. 2, pp. 195, 329, 1839.
= Orthagoriscus, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 195, 329, 1839.
= Mola, *Bonaparte*, Cat. Metod. Pesci Europei, p. 87, 1846.
× Aledon, *Castelnau*, Mém. sur Poissons Afrique Aust., p. 75, ?1860.

Molidæ with the caudal truncated behind and the skin without laminar scutes, but granulated.

It appears to have been generally overlooked, unless by some Scandinavian naturalists, that this genus first received a name, in 1798, from Cuvier. Bloch had indicated (but without naming) the genus in the following terms:

"Ce poisson [Diodon mola], quant à la forme, diffère tellement des autres poissons du même genre, qu'on pourroit avec raison lui consacrer un genre particulier, et donner la queue tronquée pour un caractère distinctif, comme Aldrovandi* et Mr. Pennant† ont décrit un de ces poissons qui étoit long, et que Mr. Pallas en a fait connoître un rond de cette espèce,‡ ce genre comprendroit trois espèces." (IV, 85, pl. 128.)

RANZANIA.

SYNONOMY.

< Orthragoriscus, *Bloch*, Syst. Ich., Schneider ed., p. 510, 1801.
< Cephalus, *Shaw*, Gen. Zool., v. 2, p. 432, 1804.
= Cephalus, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 195, 329, 1839 (not of Ranzani).
= Ranzania, *Nardo*, Ann. Sci. Regno Lombard. Venet., v. 10, p. 105, 1840.
= Orthagoriscus, *Bonaparte*, Cat. Metod. Pesci Europei, p. 88, 1846.

Molidæ with the caudal truncated behind and the skin covered with small and mostly hexagonal scutes.

Type *R. truncatus*=*Tetrodon truncatus* Retzius.

MASTURUS.

SYNONYMY.

Orthagoriscus sp., *Bleeker*.

Molidæ with the caudal extended backwards at the subaxial or submedian rays, and assuming a mastoid shape, the skin covered behind and below with scutes of various and often elongated forms, the eyes nearer the snout than the branchial apertures, and the pectorals with rays reduced in number.

Type *M. oxyuropterus* = *Orthagoriscus oxyuropterus* Bleeker.

* De Pisc., p. 413. † B. Z., III, p. 129, n. 54, fig. 7. ‡ Spic. Zool., fasc. VIII, p. 39, tab. 44.

MOLACANTHIDÆ.

SYNONYMS AS SUBFAMILY NAMES.

=Molacanthinæ, *Gill*, Cat. Fishes East Coast N. A., p. 57, 1861.
=Molacanthinæ, *Jordan & Gilbert*, Syn. Fishes N. Am., p. 865, 1883.

Moloidea with a much compressed vertically expanded body (higher than long), without a marginal posterior or caudal fin, or interspinal bones for its support, and with a short intestine "making but two turns." (Putnam.)

Pelagic fishes of very small size.

MOLACANTHUS.

SYNONYMY.

=Molacanthus, *Swainson*, Nat. Hist. and Class. Fishes, &c., v. 2, pp. 195, 329, 1839.
=Pallasia, *Nardo*, Ann. Sci. Regno Lombard. Venet., v. 10, p. 112, 1840.
=Acanthosoma, *De Kay*, New York Fauna, Fish., p. 330, ? 1842.
Molæ juv., *Steenstrup & Lütken*.
Orthagorisci juv., *Günther*.

Dr. Günther has mistaken for the young of the common *Mola rotunda* (called by him *Orthagoriscus mola*) the remarkable genus *Molacanthus*, and in 1870 quite gratuitously remarked that "these [supposititious] young fishes form a distinct family, *Molacanthidæ*, in Mr. Gill's system." Mr. Günther erred in two respects: (1) in the entirely baseless assumption that *Molacanthus* is the young of *Mola*; and (2) in the statement that *Molacanthus* had been elevated to family rank "in Mr. Gill's system."

Molacanthus is diametrically opposite to the young of *Mola*, as has been well shown by Mr. F. W. Putnam,* and the young of this family, instead of being shorter than the old, are, as might have been anticipated, *a priori*, from a knowledge of the morphology and relations of the forms, at least as long as, if not longer than, the adult.† Dr. Günther seems to have had the material at his command for a proper comprehension of the changes of *Mola*, as he claimed specimens for the British Museum from "1 inch long" to "7 feet long."‡ If his specimens "1 inch long" really were *Molæ*,§ a simple comparison of them with figures of *Molacanthi* (if he had no specimens) might have served to convince him of the difference between the two. If the specimens were *Molacanthi*,

* On the Young of *Orthagoriscus mola*. By F. W. Putnam. [August, 1870.] <Am. Nat., v. 4, pp. 629–633, Dec., 1870; also <Proc. Am. Assoc. Adv. Sci., v. 19, pp. 235–260, 1871.

† I have examined three specimens of *Mola rotunda* little larger than *Molacanthus aculeatus*.

‡ There was, however, a considerable gap between the smallest specimens ("*f*," "*k*, *l*, 1 inch long") and the next ("*d*," "*g*—*i*, stuffed, 1½ feet long"); the smallest were probably *Molacanthi*; the others *Molæ*.

§ Dr. Günther's descriptive remarks indicate that he had examined also representatives of the genus *Molacanthus*.

in view of the range of specimens of *Mola* he had, and of the differences between *Mola* and *Molacanthus*, he failed to exercise his reasoning powers when he determined the latter to be the young of the former. In fact, the differences between *Molacanthus* and *Mola* when young are considerably greater than between the former and *Mola* when old.

A slight attention to the logic of facts, aided by a very moderate use of the reasoning faculties, might have convinced Dr. Günther of the wide differences between the forms in question.

"In Mr. Gill's system," so far as was expressed in his "Catalogue of the Fishes of the East Coast of North America" (1861, p. 57), the genus *Molacanthus* was simply differentiated from *Mola* or *Orthagoriscus* as a distinct subfamily; to this extent, at least, its differentiation is justified by anatomical contrasts. It is probable, however, that even family rank should be awarded to it in order to adequately express its decided and manifold differences, and to such rank I do now propose to elevate the group. There is not much doubt that the anatomical differences already known to exist will be supplemented by others when the osteology, and especially skulls of the two types, are compared.

A REVIEW OF THE SPECIES OF LUTJANINÆ AND HOPLOPAGRINÆ FOUND IN AMERICAN WATERS.

By DAVID S. JORDAN and JOSEPH SWAIN.

In this paper is given the synonymy of the American species of the genera allied to *Lutjanus*, with descriptions of the species which we have been able to examine, and analytical tables by which these species may be distinguished.

We accept the views of Dr. Gill as to the relationships of these forms, placing them in the family of *Sparidæ*, in which group they appear to constitute two subfamilies, *Hoplopagrinæ* and *Lutjaninæ*. We arrange the American species in eight genera. Three of these (*Ocyurus*, *Rhomboplites*, and *Tropidinius*) have formerly not been admitted by us as distinct from *Lutjanus*, from which genus they are not indeed distinguishable by any single external character of high importance. An examination of a series of skulls of West Indian species, kindly shown to us by Dr. Gill, has convinced us of the desirability of recognizing each of these groups as a genus separate from *Lutjanus*, as the secondary characters of each are accompanied by well-marked peculiarities of the cranium, the structure of which is very constant in species properly referred to *Lutjanus*. For the characters drawn from the skull in the following analysis of the genera, we are indebted to Professor Gill. The skull of *Hoplopagrus* has never been studied, and that of two of the more aberrant species of *Lutjanus* (*inermis; aratus*) should be examined before their position can be considered as definitely fixed. The latter is prob-

ably a true *Lutjanus*, the former perhaps a representative of a distinct genus.

In the division of the *Lutjaninæ*, the cranial character of the separation of the interorbital area from the occipital region is evidently of more importance than that of the squamation of the soft dorsal or the separation of the spinous dorsal, characters on which Dr. Bleeker has ranged the groups here noticed in three genera, *Lutjanus*, *Aprion*, and *Etelis*.

ANALYSIS OF AMERICAN GENERA ALLIED TO LUTJANUS.

A. Nostrils remote from each other, the anterior tubular, near the end of the snout; vomer with about 3 large molar teeth; teeth in jaws coarse and blunt; dorsal spines 10; soft parts of dorsal and anal scaly. (*Hoplopagrinæ*) ..... HOPLOPAGRUS, 1.

AA. Nostrils not far apart, the anterior not tubular and not placed at the end of the snout; vomerine teeth villiform, disposed in a patch which is ∧ , ↑, or ◊-shaped; teeth of jaws acute. (*Lutjaninæ*.)

B. Interorbital area not flat nor separated from the occipital region, the median and lateral crests procurrent on it, and the frontal narrowed forward; dorsal fin continuous, the spines not separated by a notch from the soft rays.

C. Prefrontals, with the articular facets arising from diverging V-shaped ridges; basi-sphenoid, with an anterior lobiform extension; soft dorsal and anal scaly; dorsal spines 10 or 11 (in American species); tongue with teeth (at least in adult specimens).

D. Fronto-occipital crest ceasing anteriorly far from front of frontal; prefrontal with posterior areas impressed, long and cribriform; no pterygoid teeth; caudal fin lunate; gill-rakers rather few ..... LUTJANUS, 2.

DD. Fronto-occipital crest continued on ethmoidal projection; prefrontals with posterior areas short and excavated above and in front; pterygoid teeth present (in the adult) in a narrow band; caudal fin very deeply forked; gill-rakers numerous ..... OCYURUS, 3.

CC. Prefrontals with the articular facets developed from simple tubercles and not V-shaped; basi-sphenoid not lobigerous; canines small.

E. Prefrontals with the posterior areas cribriform; pterygoid, with a broad patch of teeth (in adult); hyoid bone and tongue with teeth; dorsal spines, 12 (or 13); soft dorsal and anal somewhat scaled. RHOMBOPLITES, 4.

EE. Prefrontals with the posterior areas solid and somewhat tumid; pterygoids, hyoid bone, and tongue toothless; dorsal spines, 10; soft dorsal and anal scaleless ..... TROPIDINIUS, 5.

BB. Interorbital area flat, separated by a transverse line of demarkation from the occipital, by which the median as well as the lateral crests are limited; frontals wide in front; tongue and pterygoids toothless.

F. Dorsal fin continuous; frontals not cavernous; supraorbital margin crenate; periotic region much swollen outwards, and with the bones thin and polished; preorbital moderate; frontals behind, with funnel-shaped foramina; soft dorsal and anal scaleless; last rays of dorsal and anal produced ..... APRION, 6.

FF. Dorsal nearly or quite divided into two fins by a deep notch; eyes very large; preorbital very narrow.

G. Frontals not cavernous, simply normally perforate; supraorbital margins crenate; periotic region little convex and with the bones thick, unpolished; prefrontals behind, with funnel-shaped foramina; body comparatively elongate; head naked above and on snout; soft dorsal and anal naked; peritoneum and lining of gill-cavity pale; caudal deeply forked ..... ETELIS, 7.

GG. Frontals cavernous (like those of Sciænoids), with longitudinal osseous bars, leaving interspaces in front of transverse ridge and on each side near the front; supraorbital margins smooth; prefrontals behind, with simple foramina for olfactory nerves; body comparatively short and deep; head scaly above and on jaws and snout; soft dorsal and anal scaly at base; peritoneum and lining of gill-cavity black; caudal lunate ..... VERILUS, 8.

I.—Genus HOPLOPAGRUS.

HOPLOPAGRUS, Gill, Phila. Proc. Ac. Nat. Sci., 1862, 253 (*Güntheri*)

One species of this remarkable generic type is known. With a close resemblance in nearly all respects to *L. caxis*, and other ordinary *Lutjani*, it differs in the structure of the nostrils and in the dentition entirely from all other fishes of this type.

1. Hoplopagrus güntheri. *Pargo* (Mazatlan).

Hoplopagrus güntheri, Gill, Proc. Ac. Nat Sci. Phila., 1862, 253 (Cape San Lucas); Steindachner, Ichthy. Beiträge, vi, 1878, 1 (Altata); Jordan & Gilbert, Bull. U. S. Nat. Mus., 1882, 107, 112 (Mazatlan; Punta Arenas).

Habitat.—Cape San Lucas; Punta Arenas; Mazatlan.

Head, $2\frac{3}{4}$ ($4\frac{1}{3}$); depth, $2\frac{1}{5}$ ($3\frac{3}{4}$). D. X, 14; A. III, 9. Scales, 6–47–16. Length (29581, Mazatlan), $6\frac{1}{2}$ inches.

Form oblong-ovate, the body shorter and deeper than in any American species of *Lutjanus*, the back compressed and somewhat arched, abruptly contracted to the base of the short caudal peduncle. Anterior profile very slightly and evenly convex from tip of snout to front of spinous dorsal.

Snout rather long and pointed, its length $2\frac{1}{3}$ in head. Mouth small, the maxillary scarcely reaching to front of orbit. Its length 3 in head.

Teeth in jaws arranged as in the *Lutjani*, but coarse and blunt, the lateral teeth of both jaws rounded and molar-like, more blunt in large examples. Upper jaw with about 2 coarse, rather long canines. Vomer with about 3 coarse molar teeth. Palatines and tongue toothless. Lower jaw rather weak, included. Anterior nostril at the extreme front of the snout, close to the premaxillary, in the extremity of a barbel-like tube which hangs down above the mouth and is nearly half as long as the eye. Posterior nostril a rather long and narrow oblique slit, near the front of the eye. Eye small, near the middle of the length of the head, $4\frac{1}{3}$ in head (young). Interorbital space rather broad and convex, its width $4\frac{1}{3}$ in head. Preorbital broad, its least width $3\frac{1}{2}$ to 4 in head. Vertical limb of preopercle oblique, sharply serrate, the teeth fine above, coarse at the angle.

Emargination of preopercle sharp and deep, more conspicuous than in any American species of *Lutjanus*, the knob of the interopercle conspicuous. Gill-rakers few and short, about seven developed on lower part of anterior arch, besides several rudiments. Opercle without spinous projections. Scapular scale serrate.

Scales rather small, regularly arranged; those above lateral line in series, which are throughout parallel with the lateral line; those below in horizontal series. Temporal region with a band of one or two series of large scales. Cheeks with about seven rows of scales.

Dorsal spines rather low and strong, the fin somewhat deeply emarginate. Soft dorsal high, angular, or pointed in outline, the last ray not two-fifths the height of the middle ones, which are two in head. Caudal short, feebly lunate, the upper lobe $1\frac{3}{4}$ in head. Anal high and pointed, as in *Lutjanus analis*, *vivanus*, and *colorado*, the middle rays reaching base of caudal, a little more than half length of head. Anal spines strong, the second longer and stronger than third, $2\frac{3}{4}$ in head. Pectoral long, 3 in head; ventral $1\frac{1}{2}$.

Color in spirits, olive brown, the body with about six rather conspicuous narrow whitish cross-bands, extending a little obliquely backwards, and broadest below. These are irregular in number and in width. A round, dusky blotch rather faint on base of last rays of soft dorsal. Fins mostly dusky olive, the pectorals pale, the ventrals and anal darkest. Top of head with some small dark spots.

This most remarkable species is a common food-fish of Mazatlan, where it is known as *Pargo*.

Dr. Gill has very properly considered it the type of a distinct subfamily, *Hoplopagrinæ*. Its peculiarities are certainly stronger than those of the other genera associated with *Lutjanus*.

II.—Genus LUTJANUS.

LUTJANUS, Bloch, Ausländische Fische, iv, 107 (*lutjanus*).
DIPTERODON, Lacépède, Hist. Nat. Poiss., iv, 167, 1803 (*plumieri=synagris*, etc.).
DIACOPE, Cuv. & Val., Hist. Nat. Poiss., ii, 410, 1828 (*sebæ*, etc.) (preoccupied).
MESOPRION, Cuv. & Val., Hist. Nat. Poiss., 441, ii, 1828 (*unimaculatus*, etc.).
GENYOROGE, Cantor, Malayan Fishes, 1850, 12 (*notata*).
? MACOLOR, Bleeker, Poiss. Amboine. Nederl. Tidschr. Dierkunde, 277, 1867 (*macolor*).
NEOMÆNIS, Girard, U. S. Mex. Bound. Surv., 1859, 18 (*emarginatus=griseus*).
? PROAMBLYS, Gill, l. c., 236 (*nigra=macolor*).
HYPOPLITES, Gill, l. c., 236 (*retrospinis*).
EVOPLITES, Gill, l. c., 236 (*pomacanthus*=young of *L. bengalensis*).

ANALYSIS OF SPECIES OF LUTJANUS.*

a. Dorsal spines, normally 10.
b. Anal rays III, 7 to III, 9.
c. Gill-rakers comparatively few, 7 to 15 developed on lower part of anterior arch, sometimes preceded by 1 to 5 rudiments.
d. Anal fin rounded or but slightly angulated, its middle rays less than half length of head.
e. Lower jaw not projecting beyond upper.
f. Soft dorsal normally with 14 rays.
g. Developed gill-rakers, 7 to 9, with but one or two rudiments, if any; canines strong, no black lateral spot, preorbital, deep, caudal lunate.

* In this analysis we omit *L. cyanopterus* and *L. lutjanoides*, species which we have never seen, and of which little is known.

h. Vomerine teeth forming an ↑ (anchor) shaped patch, with a distinct backward prolongation on the median line; second anal spine longer and stronger than third; upper canines very strong; in lower, moderate or small.

i. Scales above lateral line in horizontal series which are throughout parallel with the lateral line; upper canines strong; snout long and pointed; pectoral fin long; color brownish, with faint silvery streaks along rows of scales on sides, a pale-blue streak along suborbital and preorbital; fins pale.

ARGENTIVENTRIS, 2.

ii. Scales above lateral line arranged in series which are not throughout parallel with the lateral line, being oblique and irregular at least below the second dorsal.

j. Body comparatively deep, the depth about 2½ in length; snout long and pointed; soft dorsal, anal, and caudal orange or yellow, becoming pale in spirits.

k. Scales unusually large; five or six in an oblique series from first dorsal to lateral line; about 45 vertical series above lateral line between gill-opening and base of caudal; lateral line with less than 40 pores; blue streak on suborbital region not permanent ..... CAXIS, 3.

kk. Scales moderate, about nine in an oblique series from first dorsal to lateral line; about 55 vertical series above lateral line between gill-opening and base of caudal; lateral line with more than 40 pores; a whitish area below eye; blue streak along suborbital region usually not disappearing with age..... JOCÚ, 4.

jj. Body comparatively elongate, the depth 2¾ to 3 in length; snout rather pointed; mouth large; soft dorsal, anal, and caudal blackish, tinged with wine color, always becoming dusky in spirits; body dark greenish, more or less reddish below; blue streak on preorbital disappearing early.

GRISEUS, 5.

hh. Vomerine teeth forming a ∧ or ↑-shaped patch, the backward prolongation on median line wanting or very short; scales above lateral line in oblique series, which are not throughout parallel with lateral line; body comparatively elongate, the depth 3 to 3½ in length; upper and lower canines very strong; mouth large; vertical fins dusky.

l. Maxillary reaching middle of eye, 2⅔ in head... CUBERA, 6.

ll. Maxillary barely reaching to opposite front of orbit, 2⅔ in head ..... NOVEMFASCIATUS, 7.

gg. Developed gill-rakers about ten, with about five rudiments before them; canines moderate; caudal somewhat forked; vomerine teeth in a ↑-shaped patch; eye large; color chiefly red; scales above lateral line in oblique series.

m. Iris golden yellow; no black blotch on base of pectoral; scales small; lateral line with 50 tubes; second anal spine moderate, 3¼ in head; rose-color, with golden streaks; soft fins all rosy; lateral blotch disappearing with age..... PROFUNDUS, 8.

mm. Iris orange red; base and axil of pectoral with a jet-black blotch; scales moderate, about 63 vertical rows above lateral line; second anal spine long, 2⅜ in head; crimson, caudal peduncle and caudal fin largely yellow; no lateral blotch.
BUCCANELLA, 9.

ff. Soft dorsal with 12 rays; body oblong, the back not greatly elevated; mouth rather small, the upper canines moderate, the lower obsolete; scales above lateral line in very oblique series.

n. Pectoral short, 1⅔ in head; teeth on vomer in a ↑-shaped patch; color olivaceous, no black lateral blotch.
BRACHYPTERUS, 10.

nn. Pectoral long, more than two-thirds length of head; color chiefly red; a large black lateral blotch.

o. Vomerine teeth in a ↑-shaped patch, with a distinct backward prolongation on median line; color red, back and sides with rows of dark bluish-gray spots following the series of scales; similar spots on sides of head; fins reddish.
GUTTATUS, 11.

oo. Vomerine teeth in a ∧ or ↑-shaped patch, the prolongation on median line very short or wanting; color rosy, greenish above, the sides of head and body with numerous longitudinal stripes of golden yellow; soft dorsal and caudal red; lower fins yellow..... SYNAGRIS, 12.

ee. Lower jaw projecting beyond upper; teeth on vomer in a ↑-shaped patch.

p. Scales above lateral line in oblique series. Mouth moderate; body rather elongate, compressed; eye small; scales small, the lateral line with about 50 pores; dorsal rays X, 13; caudal deeply forked; anal spines graduated; gill-rakers rather numerous, about 10 on lower part of anterior arch; reddish, with horizontal yellow streaks; no black lateral blotch.
AMBIGUUS, 13.

pp. Mouth large; body rather elongate, strongly compressed; eye very large, red; scales rather small, the lateral line with about 50 pores; dorsal rays X, 12; caudal little forked; second and third anal spines subequal; gill-rakers few; dark brown, pale below, flushed with deep red; fins mostly red; a large black lateral blotch.
MAHOGONI, 14.

dd. Anal fin angulated, its median rays produced, at least half length of head; body rather robust; upper canines rather large; lower, small.

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q. Scales above the lateral line arranged in series which are not throughout parallel with the lateral line; side with a black blotch, which usually disappears with age; anal fin bright red.

r. Teeth on vomer in a ↟-shaped patch, with a median backward prolongation; lingual teeth well developed; snout rather pointed; maxillary reaching front of eye, $2\frac{1}{2}$ in head; scales rather large; about forty-eight pores in the lateral line; eight scales in an oblique series, from first dorsal spine to lateral line; color rose-red, nearly uniform ..... VIVANUS, 15.

rr. Teeth on vomer in a ⋀-shaped, without distinct prolongation on the median line; lingual teeth very few or none; snout rather pointed; maxillary scarcely reaching front of eye, $2\frac{5}{7}$ in head; scales rather small; about five pores in lateral line; ten scales in an oblique series from first dorsal spine to lateral line; color, greenish above, rosy below; a small but distinct black lateral blotch; young with oblique blue streaks above; fins mostly brick red, especially the anal; a pearly streak below eye ..... ANALIS, 16.

qq. Scales above the lateral line arranged in series, which are parallel throughout with the lateral line; no black lateral blotch; scales rather large; five or six between first dorsal spine and lateral line; lateral line with forty-seven pores; vomerine teeth in a ⋀-shaped patch; lingual teeth well developed; maxillary reaching front of pupil, $2\frac{3}{4}$ in head; color, red; dusky above; a blue streak on suborbital; anal and ventral fins dusky.

COLORADO, 17.

bb. Anal rays III, 11; body slender; snout short, pointed; mouth small; canines very small; teeth on tongue well developed; vomerine patch of teeth ↟-shaped, with a short backward prolongation; scales above lateral line in very oblique series; pectoral fins short; caudal deeply forked; anal spines very small; color, dusky, each scale with a shining silvery spot ..... INERMIS, 20.

aa. Dorsal spines 11; body elongate; scales large, those above lateral line in about four series, which are fully parallel with the lateral line; soft dorsal and anal low; vomerine teeth in a ⋀-shaped patch; lingual teeth present; gill-rakers few; color, brown, with distinct silvery stripes along the rows of scales; young with silvery cross-bars; lower fins dusky.

ARATUS, 21.

2. Lutjanus argentiventris. *Pargo amarillo.*

Mesoprion argentiventris, Peters, Berlin. Monatsber., 1869, 704 (Mazatlan).
Lutjanus argentiventris, Jordan, Proc. Ac. Nat. Sci. Phila., 1883, 285 (Mazatlan).
Mesoprion griseus, Günther, Fishes Central America, 1863, 385 (name only: Pacific) (not of C. & V.).
Lutjanus argentivittatus, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 354; Jordan & Gilbert *loc. cit.*, Bull., 1882, 107, 110 (Mazatlan; Panama); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 625 (Panama) (*lapsus calami* for *argentiventris*).*

Habitat.—Mazatlan and Panama.

Head, $2\frac{3}{5}$ ($3\frac{1}{6}$); depth, $2\frac{3}{5}$ ($3\frac{1}{6}$). D. X, 14; A. III, 8. Scales 5–45–12. 45 pores. Length (28254, Mazatlan), 11 inches.

Body formed as in *Lutjanus caxis*, moderately compressed, the back considerably elevated. Profile straight or slightly concave from snout to nape. The nuchal region rather convex. Snout long and pointed, anteriorly somewhat depressed; its length 3 in head. Eye moderate, $4\frac{1}{3}$ in head; interorbital space very gently convex; its width $6\frac{1}{2}$ in head. Mouth large, maxillary reaching a little past front of orbit; its length 3 in head; upper jaw with two strong canines in front rather weaker than in *L. caxis;* lower jaw with the teeth in the outer series enlarged, some of the lateral teeth largest, but scarcely canine-like; teeth on tongue in a single large oblong patch; teeth on vomer forming an arrow-shaped patch, with a long backward prolongation on the median line.

Gill-rakers rather few and short, about 7 on lower part of anterior arch, these not preceded by rudiments.

Preopercle with its posterior margin extending downwards and forwards, very weakly emarginate, finely serrate above, almost entire at the angle.

Scales large, much as in *L. caxis*, the series above the lateral line almost horizontal, and throughout parallel with the lateral line; scales below lateral line anteriorly in series running somewhat upward and backward; posteriorly in horizontal series; six rows of scales on the cheek; a band of about three series of rather large scales on the temporal region. Soft dorsal and anal scaly; tubes of lateral line each with 4 or 5 branches.

Dorsal spines strong, the longest $2\frac{3}{7}$ in head. Margin of soft dorsal well rounded, the middle rays 3 in head. Caudal not deeply forked, the upper lobe $1\frac{3}{7}$ in head. Anal fin rather high, somewhat rounded, the longest rays $2\frac{1}{6}$ in head. Anal spines strong, the second stronger and larger than third, $3\frac{2}{5}$ in head. Ventrals 2 in head. Pectorals reaching about to front of anal, $1\frac{1}{4}$ in head.

Color in spirits brownish above, paler below; each scale of sides somewhat silvery near its middle, these forming narrow and rather distinct dull silvery streaks which follow the direction of the rows of

*Our only copy of Dr. Peters' paper at the time these papers were printed was a manuscript transcription. In this, by a slip of the pen of the copyist, *argentiventris* became "*argentivittatus.*"

scales. A bluish horizontal streak below eye, most distinct in young examples. Fins pale; yellowish in life.

This species, the *Pargo Amarillo* of the Mazatlan fishermen, is generally common on the Pacific coast of Mexico and Central America. It bears considerable resemblance to. *L caxis, jocú*, and *griseus*, but is distinct from all of these.

3. Lutjanus caxis. *Schoolmaster; Cají.*

Perca marina pinnis branchialibus carens (the Schoolmaster), Catesby, Hist. Carolina, &c., 1743, tab. 4.

Caxis, Parra, Descr. Dif. Piezas, Hist. Nat., 1787, tab. 8, f. 2 (Havana).

? Perca apoda ("Forster, Catal. of Anim., 21"), Walbaum, Artedi Piscium, 1792, 351 (based on the Schoolmaster of Catesby).

Sparus caxis, Bloch & Schneider, Ichthyol., 1801, 284 (after Parra).

Mesoprion caxis, Poey, Repertorio, ii, 269, 1868.

Lutjanus caxis, Poey, Synopsis, 1868, 293 (Cuba); Poey, Enumeratio, 1875, 25; Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West). (Not of most recent American writers.)

Bodianus striatus,* Bloch & Schneider, Syst. Ichth., 1801, 335, tab. lxv (West Indies).

Lutjanus acutirostris, Desmarest, Prém. Dec., Ichthyol., 12, tab. 3, 1823 (Cuba).

? Mesoprion cynodon, Cuv. & Val., ii, 465, 1828 (Martinique; San Domingo); Bocourt, Ann. Nat. Hist., Paris, 1868, 224.

Mesoprion linea, Cuv. & Val., ii, 468, 1828 (Cuba; San Domingo).

Mesoprion flavescens, Cuv. & Val., ii, 472, 1828 (Martinique).

Mesoprion albostriatus, Peters, Berliner Monatsberichte, 1865, 111 (on the type of Bloch & Schneider.)

Habitat.—West Indies, north to Florida Keys.

Head, $2\frac{1}{2}$ in length ($3\frac{1}{4}$ with caudal); depth, $2\frac{1}{2}$ ($3\frac{1}{4}$). D. X, 14; A. III, 8. Scales (5†) $6\frac{1}{4}$–42§ to 45–13; 36‖ pores in lateral line. Length of an example from Key West, 9 inches.

Body comparatively deep, moderately compressed, the back considerably elevated. Profile almost straight from snout to nape, the nuchal region rather convex. Snout unusually long and pointed, its outline before eye a little depressed, its length $2\frac{5}{7}$ in head. Eye moderate, $4\frac{1}{3}$ in head. Interorbital space flattish or gently convex, $5\frac{1}{2}$ in head. Mouth large, maxillary reaching front of orbit, $2\frac{3}{5}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a single series of larger teeth; four canines in front of upper jaw; one of them on each side very large, almost as long as pupil.

Lower jaw with a narrow villiform band in front only, and an enlarged series outside, these largest on side of jaw, where some of them are somewhat canine-like. Tongue with a single large oval patch of

* Called *Bodianus albostriatus* by a slip of the pen on page 237; the plate is named *Bodianus fasciatus*.

† Number of scales in a vertical line from first dorsal spine to lateral line.

‡ Number of scales as above, but in a series obliquely downward and backward.

§ Number of vertical rows of scales above lateral line, from head to base of caudal.

‖ Number of pores in lateral line; these usually correspond very closely to the number of oblique series above the lateral line.

teeth, its length more than twice its width. Teeth on vomer forming an arrow-shaped patch with backward prolongation on median line, the length of which is twice the width of the arrow-patch in front. Gill-rakers rather short and thick, the longest about one-third diameter of eye, about nine on lower part of arch. Preopercle with its posterior margin directed somewhat obliquely forward, usually very weakly emarginate, finely serrate above, almost entire at the angle.

Scales large, decidedly larger than in *L. jocú*. The series below the lateral line almost horizontal; those above in rows parallel with the lateral line, these becoming more or less irregular posteriorly and extending upward and backward below soft dorsal. About seven rows of scales on the cheeks, one row on interopercle, one on subopercle, and seven on opercle. Temporal region with a few large scales in about two rows. Base of soft dorsal and anal scaly. Tubes of lateral line each with four or five branches.

Dorsal spines strong, the outline of the fin not greatly convex; the fourth spine longest, $2\frac{2}{3}$ in head, the tenth spine 4 in head; margin of soft dorsal well rounded, the middle rays longest, twice length of last, $2\frac{3}{4}$ in head. Caudal not deeply forked, the upper lobe longest, $1\frac{1}{2}$ length of middle rays, which are 2 in head. Margin of anal well rounded; middle rays twice length of last, $2\frac{2}{7}$ in head, the first ray reaching about to middle of last when the fin is depressed; anal spines strong, the second longer than third, $3\frac{1}{3}$ in head. Ventrals 2 in head. Pectorals reaching to front of anal, $1\frac{1}{3}$ in head.

Color of young in life, greenish, with about eight very narrow vertical paler bars on body. Scales of lower part of sides with central orange spots, forming faint streaks along the rows of scales. Belly pearly. Head greenish; a blackish streak from snout through eye to nape; a narrow, sharply-defined blue stripe below eye from snout to angle of opercle; no lateral spot. Spinous dorsal edged with orange. Ventrals, anal, and caudal pale orange-yellow. Pectorals paler.

The adult examples differ from the young in the vertical bars being fainter or obsolete, and in the absence, usually, of the blue stripe below eye and the dark stripe on temporal region. The soft dorsal, anal, and caudal are always yellow, of varying intensity, and the edge of the spinous dorsal is orange, not dusky. The whitish area below the eye, very constant in *L. jocú*, is wanting in *L. caxis*.

This species is very abundant in the markets of Havana, where it is still known as *Cají* (in old Spanish *Caxí*, of which "*Caxis*" seems to be a plural form). This persistence of the common name is the only certain basis of identification of Parra's *Caxis*. It is almost equally common at Key West, where, as in Catesby's time, it is known as the "Schoolmaster."

There seems to be little doubt that the names *striatus*, *linea*, and *flavescens* belong to this species, and in spite of the difference of color, which seems to be the fault of the printer, the *acutirostris* of Duméril

best fits here also. The *griseus* of Cuv. & Val. and of Günther, which Poey refers to the synonymy of *Caxis*, seems to us to better fit the *griseus* of Linnæus.

We refer the *Mesoprion cynodon* to the synonymy of this species on the strength of Bocourt's comparison of his *Mesoprion pacificus* (*novemfasciatus*) with *Mesoprion cynodon*. As one of the curators of the Museum at Paris, it is to be presumed that M. Bocourt had for examination the original types of *Mesoprion cynodon*, and from his description it appears that the latter species is less elongate than *L. novemfasciatus;* that its canines are smaller; that its lower jaw is less prominent, its pectoral fins longer, and the scales a little larger. The color is reddish brown above, with all the fins yellow. All these characters indicate the identity of *M. cynodon* with *Lutjanus caxis*. Certainly it is not the *Cubera*.

Peters adopts for this species Schneider's name *albostriatus* (apparently originally a mere slip of the pen for *striatus*), "because another species has been later named *Mesoprion striatus*." He identified Schneider's type with "*Mesoprion linea* C. & V."

This species is closely allied to *L. griseus* and still more nearly to *L. jocú*. The latter is very similar in form and coloration, but has decidedly smaller scales. The former is more elongate, and has the vertical fins always dark, while in *caxis* and *jocú* yellowish colors predominate.

4. Lutjanus jocú. *Dog Snapper; Jocú.*

Jocú, Parra, Descr. Dif. Piczas, Hist. Nat., i, 1787, taf. 25, f. 2 (Cuba).

Anthias jocú, Bl. & Sch., Syst. Ichthy., 310, 1801 (based on Parra).

Mesoprion jocú, Cuv. & Val., ii, 466, 1828 (Antilles; Martinique); Poey, Repertorio, 268, 1867 (Cuba).

Lutjanus jocú, Poey, Synopsis, 292, 1868 (Cuba); Poey, Enumeratio, 26, 1873; Vaillant & Bocourt, Miss. Sci. au Mex., iv, 1881? 129, pl. v, f. 1 (synonymy much confused); Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Mesoprion litura, Cuv. & Val., ii, 467, 1828 (Cayenne; St. Thomas).

Mesoprion cynodon, Günther, i, 194, 1859 (St. Domingo; Jamaica; not of Cuv. & Val.; excl. syn.).

Habitat.—Florida Keys, Cuba, San Domingo, Jamaica, Antilles, Martinique, St. Thomas, Cayenne.

Head, $2\frac{1}{2}$ ($3\frac{1}{7}$); depth, $2\frac{1}{7}$ ($3\frac{1}{3}$). D. X, 14; A. III, 8. Scales (7), 9–56–15; 45 pores. Length, 12 inches.

Body comparatively deep and compressed, the back elevated; profile steep and almost straight from snout to nape, thence little convex. Snout rather long and pointed, $2\frac{2}{3}$ in head. Eye moderate, $4\frac{2}{7}$ in head. Interorbital space narrow, gently convex, $5\frac{2}{3}$ in head. Occipital keel moderate. Preorbital broad, $4\frac{1}{3}$ in head. Mouth rather large; jaws subequal. Maxillary reaching front of orbit, $2\frac{2}{5}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a single series of larger teeth; 4 canines in front of upper jaw, two of them very large,

almost equaling in length the diameter of pupil. Lower jaw with a narrow villiform band in front only, and a series of larger teeth outside, the largest on the side of the jaw almost canine-like. Tongue with a single large oval patch of teeth, its length more than twice its width. Teeth on vomer forming a broadly arrow-shaped patch with a backward prolongation on median line twice the length of width of anterior part. Gill-rakers rather short and thick, the longest about $\frac{1}{4}$ diameter of eye, about 9 on lower part of arch, with no rudiments in front of them. Preopercle with its posterior margin slanting obliquely downward and forward, the emargination very broad and shallow; preopercle finely serrate above, the teeth coarser at the angle, which is not salient.

Scales moderate, smaller than in *L. griseus* or *L. caxis*, in nearly horizontal series below, and obliquely upward and backward above the lateral line; about 7 or 8 rows of scales on the cheek; 1 row on interopercle, 1 on subopercle, and 7 on opercle. About 3 rows of large scales on the temporal region. Top of head, snout, and jaws naked. Tubes of lateral line branched. Bases of soft dorsal and anal scaly. Dorsal spines rather strong, the outline of the fin evenly curved, the fourth and fifth spines longest, $2\frac{2}{3}$ in head; the tenth spine 4 in head. Margin of soft dorsal convex, the middle rays longest, $2\frac{5}{6}$ in head. Caudal little forked, the upper lobe longest, $1\frac{2}{3}$ length of middle rays, $1\frac{3}{4}$ in head. Margin of anal well rounded, the middle rays about twice length of last ray; the first ray reaching nearly to tip of last ray when the fin is depressed. Pectorals slightly falcate, reaching almost to front of anal, $1\frac{1}{3}$ in head. Anal spines strong, the second rather longest and strongest, $3\frac{2}{3}$ in head. Color of adult in life, olivaceous above, paler below, much flushed, so that the general hue is everywhere coppery red. Sides of body with numerous narrow cross-bars, rather faint, the light and dark of about equal width, or the pale narrower. Scales of upper parts mesially bronzed. Head coppery, especially above. A broad whitish area from eye to angle of mouth, becoming rosy in spirits. An irregular line of small round or oblong blue spots below eye, from snout to angle of opercle. Soft fins, all plain light brick red, the anal somewhat orange, the caudal more or less yellowish. Spinous dorsal, with a light orange band at base and edge, the middle pearly. The blue stripe below eye persists longer than in any of the other species which possess it.

Young in life, greenish olive, the head and breast flushed with bright coppery red. Base of each scale bright orange yellow, this color more extensive than the dark ground color, so that the general hue of the body, especially below and posteriorly, is a rich golden yellow; a dusky spot on top of head. Temporal region with a dusky shade. An undulating blue stripe below eye from snout to angle of opercle. A similar fainter streak below it. Pectorals pale red or light orange. Ventrals orange. Other fins rich golden yellow, the front of the anal and the edge of the spinous dorsal rich, clear, bright orange.

This species is about equally abundant with *L. caxis* about Florida Keys and Cuba. The English-speaking fishermen call it Dog Snapper, the Spanish *Jocú*. The fishermen usually distinguish the *Jocú* by the presence of a pale area below the eye, but the only certain distinction lies in the size of the scales. These are much smaller in *L. jocú* than in *L. caxis*.

Mesoprion litura, Cuv. & Val. is apparently this species, as also *Mesoprion cynodon*, Günther. In the synonymy of the latter species several distinct species are confounded.

Several distinct species are confounded by Vaillant and Bocourt under the name *Lutjanus jocú*.

5. Lutjanus griseus. *Gray Snapper; Mangrove Snapper; Caballerote; Lawyer.*

Turdus pinnis branchialibus carens (the Mangrove Snapper), Catesby, Hist. Carolina, 1743, tab. 9.

Caballerote, Parra, Descr. Dif. Piezas, Hist. Nat., 1787, taf. 25, f. 1.

Labrus griseus, Linnæus, Syst. Nat., x, 1758, 283 (after Catesby); Linnæus, Syst. Nat., xii, 1766, 474; Gmelin, Syst. Nat., 1788, 1283 (copied); Bloch & Schneider, Systema Ichthyol., 1801, 268 (copied).

Lutjanus griseus, Jordan, Proc. U. S. Nat. Mus., 1884 (identification of Catesby's figure).

Sparus tetracanthus, Bloch, Ichthyol., pl. 279, about 1790 (on a drawing by Plumier).

Cichla tetracantha, Bloch & Schneider, Syst. Ichth., 1801, 338 (copied).

Anthias caballerote, Bloch & Schneider, Syst. Ichth , 1801, 310 (after Parra).

Mesoprion caballerote, Poey, Repertorio, ii, 1868, 157; Poey, Proc. Acad. Nat. Sci. Phila., 1863, 187 (Cuba).

Lutjanus caballerote, Poey, Synopsis, 293, 1868; Poey, Enumeratio, 1875, 26; Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 921; Jordan, Bull. U. S. Fish Comm., 1884 (Key West); Jordan, Proc. U. S. Nat. Mus., 1884, 126 (Key West).

Bodianus vivanet, Lacépède, iv, pl. 4, f. 3, 1803 (on a drawing by Plumier).

Mesoprion griseus, Cuv. & Val., Hist. Nat. Poiss., ii, 1828, 469 (San Domingo); Guichenot, Ramon de la Sagra, Hist. Cuba, 26 (Cuba); Günther, i, 194, 1859 (Cuba; Jamaica; Puerto Cabello; British Guiana).

Lutjanus griseus, Cope, Trans. Am. Philos. Soc., 1871, 470 (St. Kitt's).

Lobotes emarginatus, Baird & Girard, Ninth Smithsonian Report, 1855, 332 (Beesley's Point, New Jersey).

Neomænis emarginatus, Girard, U. S. Mex. Bound. Surv., pl. ix, figs. 5 to 8, 1859, 18 (Brazos Santiago).

Lutjanus emarginatus, Gill, Proc. Ac. Nat. Sci. Phila. 1861, 94 (Beesley's Point).

Lutjanus caxis, Gill, Rept. U. S. Fish Comm., 1872–3, 806; Goode, Bull. U. S. Nat. Mus., 1876, v, 54 (Bermudas); Goode & Bean, Proc. U. S. Nat. Mus., 1879, 137 (West Florida); Jordan, *op. cit.*, 1880, 19 (Indian River, Florida); Bean, *op. cit.*, 1880, 96 (Bermuda); Jordan & Gilbert, *op. cit.*, 1882, 118 (Pensacola); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 578 (not *Sparus caxis*, Bloch & Schneider).

Lutjanus stearnsi, Goode & Bean, Proc. U. S. Nat. Mus., 1878, 179 (Pensacola); Jordan & Gilbert, *op. cit.*, 1882, 275 (Pensacola): Jordan & Gilbert, Synopsis Fish. N. A., 1883, 549 (copied); Goode & Bean, Proc. U. S. Nat. Mus., 1884.

Habitat.—New Jersey and Gulf of Mexico to West Indies.

Head, $2\frac{3}{4}$ ($3\frac{1}{2}$); depth, $2\frac{5}{8}$ ($3\frac{3}{4}$). D. X, 14; A. III, 8. Scales (6), 7–50–12; 47 pores. Length of an example from Key West, $10\frac{3}{4}$ inches.

Body comparatively elongate, the back not strongly compressed, little elevated; profile almost straight from snout to nape, thence gently convex. Snout rather pointed, 3 in head. Eye rather small, $4\frac{2}{3}$ in head. Interorbital space gently convex, 5 in head. Occipital keel little prominent. Preorbital rather broad, $5\frac{1}{2}$ to $6\frac{1}{2}$ in head. Mouth large; jaws subequal. Maxillary reaching front of pupil, $2\frac{2}{3}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a single series of enlarged teeth; 4 canines in front of upper jaw, 2 of them quite large—one-third diameter of eye. Lower jaw with a very narrow band of villiform teeth in front of jaw only: outside of these a single row of teeth larger than outer teeth of upper jaw, becoming canine-like in adult, but much smaller than in *L. cynodon*. Tongue with an oval patch of teeth, its width about one-half its length. Vomer with an arrow-shaped patch of teeth, with backward prolongation on the median line; its length about twice its width in front. Gill-rakers rather short and thick, their length about $\frac{1}{3}$ diameter of eye; about 8 on lower arch, with no rudimentary ones before them. Preopercle with its posterior margin nearly vertical, with a rather broad and deep emargination. Preopercle finely serrate above the teeth, coarser at the angle. Scales comparatively large; the rows in horizontal series below the lateral line, those above running parallel with the lateral line until below the soft dorsal, where they become slightly irregular and oblique; 7 rows of scales on cheek; an imbedded row on interopercle; 1 row on subopercle, and 7 on opercle. Temporal region with about three rows of large scales. Top of head, snout, and jaws naked. Base of soft dorsal and anal scaly. Tubes of lateral line branched.

Dorsal spines rather strong; the outline of the fin gently convex; the fourth spine longest, $2\frac{1}{2}$ in head, the tenth spine 4 in head. Margin of soft dorsal rounded; the ninth and tenth rays longest, $1\frac{1}{3}$ length of first, and $1\frac{2}{3}$ last ray, $2\frac{1}{2}$ in head. Caudal emarginate, the upper lobe longest, $1\frac{1}{3}$ length of middle rays, which are $1\frac{3}{4}$ in head. Anal fin high; its margin slightly angulate; the middle rays longest, 2 times length of last ray, $2\frac{1}{6}$ in head; first ray reaching almost to tip of last ray, where the fin is depressed; second anal spine slightly longer and stronger than third, $3\frac{1}{4}$ in head. Ventrals $1\frac{3}{4}$ in head. Pectorals shortish, scarcely reaching vent, $1\frac{1}{7}$ in head. Color in life very dark green above, the middle part of each scale brassy black, its edge broadly pearly whitish. Below lateral line the duskiness of the middle of the scale passes into brassy, and below into bright coppery, the belly and lower parts of head being more or less distinctly bright coppery red; the lower jaw grayish. No blue stripe below eye, except in the very young. Top of head blackish olive. Dorsal blackish, its margin darker and tinged with maroon red; soft dorsal dusky anteriorly slightly edged with whitish; caudal violaceous or maroon black. Anal wine-color edged

with whitish. Pectorals pale flesh color. Ventrals whitish, faintly marked with reddish.

Young (as in *L. caxis*) with a blackish band from snout through eye to nape, very distinct in life; a blue streak below eye. Spinous dorsal with a dark maroon-colored band along edge.

Fishes from deep water are much redder than those taken near the shore. In no case is the caudal yellowish or of any pale shade.

This species is very common along our South Atlantic and Gulf coasts and occasionally strays northward as far as New Jersey, being the northernmost in its range of any member of the genus in the Atlantic. It is everywhere generally known as Gray Snapper. In Florida and the Bahamas, where the coasts are lined by mangrove bushes among which the young of this species abounds, the name Mangrove Snapper comes into use. The name Lawyer is also occasionally heard, in allusion to the skill shown by the species in eluding nets. To the Spanish fishermen of Cuba and Key West the species is, as in the time of Parra, known as *Caballerote*. It inhabits water of varying depths, large specimens being often found very near the shore, while others may be taken in waters of considerable depth, in company with *Lutjanus vivanus*. These latter individuals are much redder than those found in shoal water; their general color is paler and the body is in general a trifle less elongate. Such correspond to the form named *Lutjanus stearnsi*.

The synonymy of this species is considerable. It is evidently the *Caballerote* of Parra, as Professor Poey has shown, and therefore the *Anthias caballerote* of Bloch & Schneider. Earlier than this comes *Labrus griseus*, L., based on the Mangrove Snapper of Catesby, a rough and inaccurate figure, but still resembling this species, and like the *Caballerote* identifiable by the persistent vernacular name. *Sparus tetracanthus* appears to be the same, as also *Bodianus vivanet*.

Mesoprion griseus, Cuv. & Val. is identified by Poey with *Lutjanus caxis*, but to us the description resembles much more the present species, which has thus twice received the specific name of *griseus*.

Lobotes emarginatus is based on a young specimen of *Lutjanus griseus*, afterwards made the type of the wholly gratuitous "genus," *Neomænis*.

The identification by Poey of *Lutjanus caxis* with *Mesoprion griseus* has led American writers to suppose this species to be the true *Lutjanus caxis*, an error only recently corrected. The true *L. caxis*, the *Cají* of the Havana markets, has not yet been seen north of Key West.

Lutjanus stearnsi, described from Pensacola, we are unable to separate from ordinary deep-water specimens of *L. griseus*. So far as we can see, the gradation is perfect. This identity has been already recognized by Dr. Bean.

Dr. Günther identifies with his *Mesoprion griseus* one or two species described by Cuvier and Valenciennes from the west coast of Africa. It is impossible from the brief descriptions to settle this question, and

the confusion in the synonymy given by Dr. Günther, shows that his material was insufficient to form any definite opinions.

This species is closely allied to *L. caxis* on the one hand and to *L. cubera* on the other; the former is deeper and differently colored, as already stated. The latter is similar in form and color, but has the dentition of lower jaw and vomer different.

This species rarely exceeds 6 or 8 pounds in weight, while *L. cubera* reaches a much greater size.

6. **Lutjanus cubera.** *Cubera.*

Mesoprion cynodon, Poey, Repertorio, ii, 268, 1868; Poey, Proc. Ac. Nat. Sci. Phila., 1863, 185 (Cuba; not of Cuv. & Val.).

Lutjanus cynodon, Poey, Synopsis, 1868, 294.

? *Genyoroge canina*, Steindachner, Ichth. Notizen, ix, 18, 1869 (Lagos; probably young).

Lutjanus cubera, Poey, Ann. Lyc. Nat. Hist. N. Y., 75, 1871 (Cuba); Poey, Enumeratio, 1875, 27.

? *Lutjanus dentatus*, (A. Duméril MSS.?) Vaillant & Bocourt, Miss. Sci. au Mex., 1881 (?) 125 (Brazil?; comparison with *L. pacificus*).

Habitat.—West Indies; Cuba; Brazil.

Head, $2\frac{3}{4}$; depth, 3. D. X, 14; A. III, 8. Scales (6), 7–50–12; 50 pores. Length of a specimen from Cuba, $17\frac{1}{2}$ inches.

Body elongate, rather robust, the back little elevated; profile from snout to nape nearly straight. Snout long, thick, rather acute in profile, 3 in head. Eye rather small, $5\frac{2}{3}$ in head. Interorbital space flattish or gently convex, $6\frac{1}{4}$ in head. Occipital keel low. Preorbital broad, $4\frac{2}{3}$ in head. Mouth very large. Maxillary reaching middle of eye, $2\frac{1}{3}$ in head. Canine teeth larger than in any other species, especially those in lower jaw. Upper jaw with a narrow band of villiform teeth, outside of which is a series of strong sharp teeth; 4 canines in front, two of them very long and strong, their length $\frac{2}{3}$ diameter of eye. Lower jaw with 5 or 6 very strong canine-like teeth on each side; the largest little smaller than the canines of upper jaw; a few villiform teeth in front of jaw. Tongue with a large oblanceolate patch of teeth, pointed behind, its length about twice its greatest width; vomer with ∧-shaped patch of teeth, usually without backward prolongation on median line, but sometimes with a short median prolongation, (⩚) its length always less than the width of the patch in front. Pterygoid and hyoid bones without teeth. Gill-rakers rather short and thick, about $\frac{1}{3}$ length of diameter of eye, about 8 on lower arch; no rudiments. Preopercle with posterior margin nearly vertical, the emargination broad and shallow. Preopercle finely serrate above the teeth, coarser just above the angle; lower limb almost entire.

Scales rather large, loosely attached; cheeks with about 8 rows, 1 row on interopercle, 1 row on suboperele, and about 7 on opercle. Temporal region with about two rows of large scales. Tubes of lateral line simple. Base of soft dorsal and anal scaly.

Dorsal spines rather strong, the outline of the fin gently convex, the fourth spine longest, $3\frac{1}{4}$ in head; the tenth spine, 6 in head. Anal spines strong, the second spine stronger, slightly shorter than third, which is 5 in head. Caudal little forked. Pectorals about $1\frac{2}{3}$ in head.

Color dusky gray, paler below, the belly sometimes tinged with reddish. Membranes of dorsal, anal, and caudal grayish black, the anal and soft dorsal especially blackish. Ventrals blackish at tip. Pectorals plain olivaceous, the base and inner margin dusky. Head dusky above, without markings.

No young specimens seen.

The adult *Cubera* as seen in the markets has a peculiarly ragged appearance, quite unlike the neat look of its nearest relative, *L. griseus*.

This species is common in the markets of Havana, where it is known as *Cubera*. It grows to a very considerable size, and specimens of less than five pounds weight are very rare in the markets. But one specimen was obtained by Professor Jordan, no others small enough to be readily preserved in alcohol being seen. The species seems to have an indifferent reputation as a food-fish, being often unwholesome. It has always a ragged appearance in the market, its scales being less firmly attached than those of other species. This species is very closely related to *L. griseus*, but so far as we have seen the two may always be distinguished by the difference in form of the vomerine patch of teeth, and by the development of the canines of the lower jaw. These are larger in *L. cubera* than in any other American species. This species is certainly not *Mesoprion cynodon*, Cuv. & Val., if we may rely on Bocourt's account of that species. It is, of course, certainly the *Lutjanus cubera* of Poey. The *Genyoroge canina* of Steindachner seems to be, most probably, the young of the same species. We have, however, hesitated to use the earlier name (*caninus*) until the identity of the two is fully proven. We suppose the name *Lutjanus dentatus*, Duméril to belong to this species, but are unable to find the original description, if any exists. The scanty characterization given by Vaillant and Bocourt agrees fully with *L. cubera*.

7. Lutjanus novemfasciatus. *Pargo Prieto.*

Lutjanus novemfasciatus, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 251 (Cape San Lucas; very young); Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881; Jordan & Gilbert, *loc. cit.*, 1882, 360 and 625 (Cape San Lucas; Panama); Jordan & Gilbert, Bull. U. S. Nat. Mus., 107, 110, 112 (Mazatlan; Panama; Punta Arenas).

Mesoprion pacificus, Bocourt, Ann. Sci. Nat. Paris, p. 223, 1868 (Tanesco; Pacific coast of Guatemala).

Lutjanus pacificus, Vaillant & Bocourt, Mission Scientifique au Mexique, 1881 (?), 123, pl. iii, f. 2.

Lutjanus prieto, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 232, 338, 353, 355 (San Blas; Mazatlan); Jordan & Gilbert, *loc. cit.*, 1882, 360, 361 (Cape San Lucas).

This large fish is the Pacific representative of *Lutjanus cubera*, to which it bears a strong resemblance. It is generally common on the

Pacific coast of tropical America, and at Mazatlan it is known as *Pargo Prieto.*

It was first described from very young specimens, which bear little resemblance to the adult, although comparison of specimens have assured us of their identity. The nine cross bands, which suggested the inappropriate specific name, are characteristic only of the very young.

The name *Mesoprion pacificus* was overlooked by Jordan and Gilbert, who published the first satisfactory account of the species, under the name of *Lutjanus prieto.* This description having been already printed in these proceedings, need not be repeated here.

8. Lutjanus profundus. *Pargo de lo Alto.*

Mesoprion aya, Cuv. & Val., ii, 1828, 457 (San Domingo); Guichenot, Ramon de la Sagra, Hist. Cuba, 24 (Cuba); Günther, i, 198, 1859 (Jamaica); Poey, Repertorio Pisc. Cubens., i, 1867, 267 (probably not *Bodianus aya*, Bloch).

Mesoprion profundus, Poey, Memorias, ii, 150, 1860 (Cuba); Poey, Repertorio, ii, 1868, 157; Poey, Synopsis, 1868, 294.

Lutjanus profundus, Poey, Enumeratio, 1875, 28.

Lutjanus purpureus, Poey, Enumeratio Pisc. Cubens., 1875, 29 (name taken from *Mesoprion purpureus*, C. & V., ii, 471, 1828; the name *purpureus* evidently a slip of the pen for *aya*).

Head, $2\frac{3}{4}$ ($3\frac{1}{2}$); depth, 3 ($\frac{1}{4}$). D. X, 14; A. III, 8. Scales (7), 8–72–17; 50 pores. Length of an example from Cuba, 10 inches.

Body rather slender, subelliptical, the back not greatly elevated; profile very slightly convex from snout to nape, thence more arched. Snout rather long and pointed, 3 in head. Eye rather large, 4 in head; interorbital space slightly convex, $4\frac{1}{4}$ in head, the occipital keel not very prominent; preorbital rather broad, $5\frac{1}{2}$ in head. Mouth rather small; jaws subequal; maxillary reaching front of pupil, $2\frac{1}{2}$ in head; upper jaw with a narrow band of villiform teeth, outside of which is a single series of well-developed teeth; 4 moderate canines in front of jaw, the two longest about one-half diameter of pupil. Lower jaw with a single series of rather large, unequal teeth, inside of which is a very narrow band of villiform teeth in front of jaw only. Tongue with an oval patch of teeth, about twice as long as broad, in front of which is a roundish patch; no teeth on hyoid bone. Pterygoids toothless; vomer with a broadly arrow-shaped patch of teeth, with a backward prolongation on median line somewhat longer than width of the patch in front. Gill rakers slender, their length almost equal to one half diameter of eye, about 11 developed below the angle; in front of these about 5 rudiments. Preopercle, with posterior limb slanting slightly downward and forward, with a broad and rather shallow emargination, its margin finely serrate above; coarser teeth at the angle and on lower limb. Posterior nostril oval.

Scales very small, the rows running obliquely upward and backward above the lateral line, the rows below almost horizontal; 7 rows of scales on cheek, 2 rows on interopercle, $1\frac{1}{2}$ rows on subopercle and about 8 on

opercle; temporal region, with 1 row of large scales, behind which are smaller ones; top of head, snout, and jaws naked; base of soft dorsal and anal scaly.

Dorsal spines rather strong, the outline of fin rather strongly convex and without deep emargination; fourth spine longest, $2\frac{2}{3}$ in head; the tenth, $3\frac{2}{3}$ in head. Margin of soft dorsal straightish, rounded behind, the ninth ray longest, $1\frac{1}{3}$ length of first and two times last ray, $2\frac{1}{2}$ in head. Caudal lunate, the upper lobe slightly longer than lower, its length $1\frac{1}{2}$ times middle rays, which are 2 in head. Margin of anal angulate, the middle rays longest, 2 times length of last ray, $1\frac{1}{3}$ in head; the first ray reaches almost to tip of last ray, when the fin is depressed. Ventrals, $1\frac{2}{3}$ in head. Pectorals not quite reaching front of anal, $1\frac{1}{3}$ in head. Second anal spine slightly longer than third, $3\frac{1}{4}$ in head.

Color in life bright rose-color, paler below, some narrow undulating light golden streaks following the rows of scales above the lateral line. Iris always bright *yellow* (an important color mark); mouth reddish within. Traces of dark lateral spot in most specimens. Dorsal rosy, its base pale, its edge yellow; caudal rosy, dusky behind, sometimes blood-red at tip. Pectorals very pale yellow, ventrals and anal pale rosy, the latter yellowish behind.

The bright colors all fade and disappear in spirits. The scales of the upper parts, in spirits, are marked with dark dots which form streaks along the rows of scales.

This handsome species is rather common in the markets of Havana, where it is known as *Pargo de lo Alto*. When fresh it may always be known by the bright yellow color of the eye, a color which does not entirely fade in spirits. It is evidently the *Mesoprion aya* of Cuv. & Val., but it is apparently not the original *Bodianus aya* of Bloch, as the latter species is said by Maregrave and Bloch to have the iris red.

Poey recognizes, under the name of *Lutjanus purpureus*, a second species which differs from *L. profundus* only in having small scales very close to the eye. This seems to be a character of little importance on which to recognize a distinct species.

The name *purpureus* is credited to Cuvier, but, in the single place (vol. ii, p. 457) where the name occurs, *purpureus* is evidently a mere slip of the pen for *aya*. Probably it was originally a MS. name, for which the latter name taken from Bloch was taken.

9. Lutjanus buccanella. *Sesí de lo Alto.*

Mesoprion buccanella, Cuv. & Val., ii, 1828, 455 (Martinique); Guichenot, Ramon de la Sagra, Cuba, 23 (Cuba); Günther, i, 198 (Cuba; Jamaica).

Lutjanus buccanella, Poey, Synopsis 1868, 295; Poey, Enumeratio, 27.

Mesoprion caudanotatus, Poey, Memorias, i, 440, about 1858, tab. 3, f. 2 (Cuba; young); Poey, Repert., ii, 158, 1868.

Habitat.—Martinique and Cuba.

Head, $2\frac{1}{2}$ ($3\frac{1}{3}$); depth, $2\frac{1}{3}$ ($3\frac{2}{3}$). D. X, 14; A. III, 8. Scales (6) 8–63–15; 50 pores. Length of an example from Cuba, 8 inches.

Body rather slender, subelliptical, the back moderately elevated; profile almost straight from snout to nape, thence convex; snout rather long and pointed, 3½ in head; eye large, 3½ in head. Interorbital space slightly convex, 5⅜ in head, the occipital ridge low. Preorbital rather narrow, 7½ in head; mouth rather small, the jaws subequal. Maxillary reaching almost to front of pupil, 2⅔ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a series of moderately enlarged teeth; four rather strong canines, two of them longer, about one-half diameter of pupil; lower jaw with a single series of unequal teeth as strong as upper; inside of these is a narrow band of villiform teeth in front of jaw only. Tongue with a single long oval patch of teeth, its length more than twice its width. Vomer with a broadly arrow-shaped patch of teeth with a backward prolongation on median line, its length scarcely greater than width of patch in front. No teeth on pterygoid or hyoid bones. Gill-rakers numerous, about 12 developed on lower part of arch, besides five or six very small or rudimentary ones, those near the angle larger, their length 2½ in eye. Preopercle with its posterior margin oblique and nearly straight, a broad and rather shallow notch above its angle; its edge strongly serrate, the teeth coarser at angle and on lower limb.

Scales rather small, the rows above the lateral line running upward and backward, the rows below nearly horizontal; about six rows of scales on the cheeks, one or two rows on interopercle, one row on subopercle, seven or eight rows on opercle. Base of soft dorsal and anal scaly; the outline of the fin rather strongly convex. Temporal region with a band of large scales, behind which are small scales. Top of head, snout, and jaws naked.

Dorsal spines moderately strong, the fifth spine 2½ in head; the tenth spine 3½ in head; margin of soft dorsal nearly straight, its rays almost of equal length, 3⅜ in head; caudal moderately forked, the upper lobe slightly the longer, 1⅜ length of middle rays, which are 2⅛ in head; margin of anal gently convex, the middle rays slightly longer than last, 2⅛ in head; the tip of first soft ray almost reaching tip of last ray when the fin is depressed; anal spines strong, the second longer and stronger than third spine, 2⅜ in head. Ventrals, 1⅛ in head; pectorals reaching opposite first soft ray of anal, 1¼ in head.

Color in life crimson, silvery below flushed with crimson, axil and base of pectorals jet black; eye orange, dorsal crimson, its edge scarlet; caudal orange yellow, as also part of caudal peduncle; last rays of soft dorsal, most of anal and ventrals yellow; pectorals, base of anal, and ventral spines pinkish. In spirits the bright colors fade, leaving the body pale reddish, the base of the pectoral within and without jet black.

This small and strongly marked species is common in the deeper waters about Havana, and is known in the markets as *Sesí* or *Sesí de lo Alto*.

The synonymy of the species offers no difficulty. A young specimen was once described by Poey as a distinct species under the name of

Mesoprion caudanotatus, but its identity with *L. buccanella* is unquestionable.

10. Lutjanus brachypterus.

Lutjanus brachypterus, Cope, Trans. Am. Phil. Soc., 1871, 470 (New Providence).

Habitat.—Bahama Islands.

Head, $2\frac{3}{4}$; depth, 3. D. X, 12; A. III, 8. Scales (6), 8–51–x; 47 pores.

Form of *Lutjanus griseus*. Maxillary, $2\frac{1}{2}$ in head, reaching to past front of eye. Canines very small, developed in upper jaw only. Tongue with an oval patch of teeth. Vomer with a Λ-shaped patch of teeth; there being a short backward projection on the median line. Eye rather small, $4\frac{2}{5}$ in head. Gill-rakers few, arranged as in *L. griseus*.

Scales above lateral line arranged in very oblique series. Two bands of small scales on temporal region.

Anal fin low, its longest rays $2\frac{3}{5}$ in head. Second anal spine about as long as third, $3\frac{5}{6}$ in head. Caudal little forked, its longest rays $1\frac{1}{2}$ in head. Pectoral fin short, $1\frac{2}{3}$ in head. Color in spirits, olivaceous, with silvery luster below; rows of obscure dusky spots along the scales on sides and yellowish oblique streaks above the lateral line. Fins rather dark, the caudal not pale; no black lateral spot.

The above account is taken from Professor Cope's original type in the Museum of the Academy at Philadelphia. The species is allied to *L. griseus*, although apparently distinct from that species and from all others known to us. In its technical characters it approaches most closely to *L. synagris*, near which species it is convenient to place it in our analytical key. If we suppose the type of *L. ambiguus* to be a hybrid, *synagris-chrysurus*, we may suspect *L. brachypterus* to represent a hybrid of *griseus* and *synagris*. The evidence in the latter case is less striking than in the former.

11. Lutjanus guttatus. *Flamenco.*

Mesoprion guttatus, Steindachner, Ichthyol. Notizen, x, 18, 1869, taf. viii. (Mazatlan).

Lutjanus guttatus, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 354; Jordan & Gilbert, *op. cit.*, 1882, 625 (Panama); Jordan & Gilbert, Bull. U. S. Fish Comm., 1882 (107), 110 (Mazatlan; Panama).

Habitat.—Mazatlan; Panama.

Head, $2\frac{3}{4}$ ($3\frac{1}{3}$); depth, $2\frac{3}{4}$ ($3\frac{1}{3}$). D. X, 12 (rarely XI, 11); A. III, 8. Scales, (6) 7–53–15; 53 pores. Length (29434, Mazatlan), $10\frac{1}{2}$ inches.

Body oblong, compressed, the back rather more elevated than in *L. synagris*, the anterior profile nearly straight from snout to above eye, thence rather strongly convex. Snout pointed, rather long, $3\frac{1}{4}$ in head. Eye large, $4\frac{1}{2}$ in head. Interorbital space gently convex, its width $5\frac{3}{4}$ in head. Occipital keel rather prominent. Preorbital narrow, its least width 7 in head. Maxillary extending to somewhat beyond front of orbit,

$2\frac{2}{10}$ in head. Teeth as in *L. synagris*, the canines in upper jaw small, those of lower jaw inconspicuous. Tongue with a single large oblong patch of teeth. Vomer with a ↑-shaped patch of teeth, the prolongation on the median line rather short.

Gill-rakers rather long, about 9 on lower part of arch, with a few rudiments in front of them. Posterior limb of preopercle extending downward and forward, the emargination broad and rather shallow. Teeth at angle of preopercle rather coarse, those above emargination much finer.

Scales rather large, those below lateral line in series which are almost horizontal, those above in series which are very oblique and for the most part regular and nearly straight. Cheek with six rows of scales, interopercle with one. Temporal region with a series of large scales, before and behind which is a broad band of small ones. Base of soft dorsal and anal scaly.

Dorsal spines rather slender and weak, the outline of the fin gently convex, the longest spine $2\frac{2}{3}$ in head. Soft dorsal short and moderately high, its margin angulated, the eighth ray about one-third longer than last ray, and $2\frac{1}{3}$ in head. Caudal lunate, the upper lobe $1\frac{1}{2}$ in head. Anal moderate, rounded in outline, its longest ray $2\frac{2}{3}$ in head; first soft ray reaching tip of last ray when the fin is depressed. Second anal spine stronger than third and of about equal length, $4\frac{1}{8}$ in head. Ventrals $1\frac{5}{6}$ in head. Pectorals long, nearly reaching front of anal, $1\frac{1}{3}$ in head.

Color in spirits brown above, the sides bright silvery. A large, round, black lateral blotch, as large as eye, on lateral line below front of soft dorsal. Each scale above lateral line with a faint darker grayish median spot, these forming oblique streaks. Sides of head often with similar spots. Two or three similar streaks often present below lateral line, these straight and horizontal; each series of scales below lateral line with a narrow yellow stripe. Snout and preorbital with dark vermiculations. Fins all pale. In life the fins are brick red and the body is largely flushed with bright red.

This species represents *Lutjanus synagris* on the Pacific coast. It is a common food-fish both at Mazatlan and Panama.

12. Lutjanus synagris. *Lane Snapper; Biajaiba.*

Salpa purpurescens variegata (the Lane Snapper), Catesby, Hist. Nat. Carol., 1743, tab. 17.

Sparus synagris, Linnæus, Syst. Nat., x, 280, 1758 (after Catesby); Linnæus, *op. cit.*, xii, 470; Gmelin, Syst. Nat., 1788, 1275; Bloch & Schneider, Syst. Ichth., 1801, 274 (copied).

Lutjanus synagris, Poey, Enumeratio, 1875, 27 (Cuba); Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West); Jordan & Gilbert, Synopsis Fish. N. A., 1883, 922; Jordan, Bull. U. S. Fish Comm., 1884 (Key West); Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Sparus vermicularis, Bloch & Schneider, Syst. Ichth., 1801, 275 (on a drawing by Plumier).

Dipterodon plumieri, Lacépède, Hist. Nat. Poiss., 1803, iv, 167 (on a drawing by Plumier).

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Lutjanus aubrieti, Desmarest, Prém. Dec. Ichth., 17, 1823, pl. 2 (Cuba); Vaillant & Bocourt, Miss. Sci. au Mex., 1881 (?) 126 (Jamaica; Hayti; Cuba; Montevideo).

Mesoprion uninotatus, Cuv. & Val., ii, 449, 1828 (San Domingo; Martinique) Agassiz, Spix, Pisc. Brasil, 1829, pl. 65; Castelnau, Anim. nouv. ou rares Amér. Sud, 4; Guichenot, Ramon de la Sagra, Cuba, 21; Günther, i, 202, 1859 (Cuba; Puerto Cabello; San Domingo; Jamaica; Bahia).

Lutjanus uninotatus, Poey, Synopsis, 1868, 294; Cope, Trans. Am. Philos. Soc., 1871, 470 (St. Martin's).

? *Mesoprion ambiguus*, Poey, Memorias Cuba, ii, 152, 1860, tab. 12, f. 4 & tab. 13, f. 18 (Cuba); Poey, Synopsis, 295.

? *Lutjanus ambiguus*, Poey, Enumeratio, 1875, 30.

Habitat.—Pensacola to Aspinwall and Brazil.

Head, $2\frac{3}{5}$ ($3\frac{2}{5}$); depth, $2\frac{4}{5}$ ($3\frac{2}{3}$). D. X, 12; A. III, 8. Scales, (7) 8–60–15 (50 pores). Length of a specimen from Key West, 8 inches.

Body oblong, compressed, the back moderately elevated, profile almost straight from snout to nape. Snout rather pointed, 3 in head. Eye moderate, 5 in head. Interorbital space gently convex, $5\frac{3}{4}$ in head. Occipital keel little prominent. Preorbital rather broad, $4\frac{3}{4}$ in head. Maxillary reaching front of orbit, $2\frac{3}{4}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a single series of enlarged teeth; 4 rather small canines in front, two of them larger. Lower jaw with villiform band in front only, the single row of larger teeth nearly equal in size, none of them canines. Tongue with a single oval patch, its length more than twice its width. Vomer with a ∧ or ↑ shaped patch of teeth, without backward prolongation on median line, or with only a very slight one. Gill-rakers rather long, their length slightly more than half diameter of eye, about 9 on lower part of arch, and no rudiments before them. Preopercle with its posterior margin slanting downward and forward, the emargination broad and moderately deep. Preopercle rather finely serrate above, with coarser teeth at the angle.

Scales rather small, the rows almost horizontal below the lateral line, above somewhat undulate, running upward and backward; tubes of lateral line simple; 7 rows of scales on the cheek, 1 row on the interopercle, 1 on the subopercle, and 6 on the opercle. Temporal region with a broad band of scales, arranged in several series. Base of soft dorsal and anal scaly. Dorsal spines rather weak and slender, the outline of the fin gently convex; the fourth spine longest, $2\frac{1}{4}$ in head; the tenth spine $3\frac{2}{3}$ in head. Soft dorsal short, its margin somewhat angulated, the eighth ray longest, twice the length of last ray and one and a half first, $2\frac{2}{5}$ in head. Caudal moderately forked, the upper lobe the longest, $1\frac{1}{2}$ length middle rays, which are two in head. Anal rather high, rounded in outline, its middle rays longest, $1\frac{2}{3}$ length of last ray,

2¼ in head; first ray reaching middle of last ray when the fin is depressed. Second anal spine stronger than third and of equal length, 3⅔ in head. Ventrals 1¾ in head. Pectorals reaching front of anal, 1½ in head.

Color in life rose-colored, silvery tinged below, slightly olivaceous but not dark above. A large, round, maroon blotch, larger than eye, just above lateral line and below front of soft dorsal, always present. Series of stripes of deep golden yellow along sides: 3 on head, the upper from snout through eye; about 10 on body, the lower nearly straight and horizontal, the upper undulating and irregular, extending upward and backward. Belly white, its sides largely yellowish. Lips red; maxillary partly yellow; tongue yellowish; iris fiery red. Caudal deep blood-red. Spinous dorsal nearly transparent, with a marginal and basal band of golden. Soft dorsal light red, edged with golden. Ventrals and anal golden yellow. Pectorals pinkish.

Young specimens quite green above. Similarly striped Cuban specimens are generally duller, with the yellow stripes decidedly coppery.

In spirits the bright colors fade, only the lateral blotch and the streaks on the head being persistent.

This species is very common almost everywhere from Pensacola to Brazil. It reaches but a small size, rarely exceeding a foot, and it inhabits chiefly shallow waters. It is known about the Florida Keys and Bahamas as Lane Snapper, and in Cuba as *Biajaiba*. In Havana it is one of the most common food-fishes, in abundance not exceeded by any other species.

Its strongly marked coloration renders its recognition from descriptions easy, and little doubt exists in its extensive synonymy.

There is no doubt whatever as to the species intended by the Lane Snapper of Catesby. The name *synagris* of Linnæus is, therefore, without doubt, the one which should be retained for the species.

The relation to this species of the *Lutjanus ambiguus* of Poey is discussed below.

13. Lutjanus ambiguus.

Mesoprion ambiguus, Poey, Memorias Cuba, ii, 152, 1860, tab. 12, f. 4; tab. 13, f. 18 (Cuba); Poey, Synopsis, 295.

Lutjanus ambiguus, Poey, Enumeratio, 1875, 30.

Habitat.—Cuba. One specimen known.

Head, 2⅛ (3⅔); depth, 3 (3¾). D. X, 13; A. III, 9. Scales, (6) 9–53–15; 50 pores. Length (13036, Havana), 9¾ inches.

Body oblong, compressed, formed much as in *L. synagris*, but more slender, the anterior profile nearly straight from tip of snout to nape, thence convex. Snout rather long and pointed, 3 in head. Eye small, 4⅔ in head. Interorbital space narrow, carinate, its width 5⅕ in head. Occipital keel rather prominent. Preorbital moderate, its least width 6 in head. Mouth moderate, slightly oblique, the lower jaw a little projecting, the maxillary extending to opposite front of pupil, its length

$2\frac{3}{4}$ in head. Teeth essentially as in *L. synagris;* canines of upper jaw small; enlarged teeth of lower jaw scarcely canine-like. Tongue with a single, large, oblong patch of teeth. Vomer with a ↑-shaped patch of teeth, the prolongation on the median line moderate. No pterygoid teeth. Gill-rakers longer than in most species of *Lutjanus;* about 15 developed on lower part of anterior arch.

Preopercle nearly vertical, its emargination very slight, its serræ distinct.

Scales rather small, those below lateral line in horizontal series; those above lateral line in regular and very oblique series, which are not parallel with the lateral line. Cheeks with 5 rows of scales. Temporal region scaled from the eye backwards, posteriorly with a band of rather large scales followed by smaller ones. Bases of soft dorsal and anal scaly. Dorsal fin little emarginate, the spines rather slender and low, the longest $2\frac{1}{2}$ in head. Longest ray of soft dorsal $2\frac{1}{5}$ in head. Caudal rather deeply forked, the longest rays $1\frac{1}{4}$ in head, the median rays $3\frac{2}{3}$. Anal spines slender, regularly graduated, the second spine $4\frac{1}{3}$ in head. Soft anal rounded, rather low, the longest rays $2\frac{2}{3}$ in head. Pectorals long and falcate, $1\frac{1}{6}$ in head. Ventrals $1\frac{2}{3}$.

In spirits this specimen is now nearly uniform brownish above, paler below, with pale streaks along the rows of scales. In life, according to Poey's figure, it had much the coloration of *Lutjanus synagris.*

Only Poey's original type of the species is yet known. From this the above description is taken.

As will be seen, the species is very well distinguished from *Lutjanus synagris* and from *Ocyurus chrysurus.* It, however, presents such a singular blending of the characters of the two as to lend much probability to Poey's conjecture that it is a hybrid of *Lutjanus synagris* with *Ocyurus chrysurus.*

14. Lutjanus mahogani. *Ojanco.*

Mesoprion mahogani, Cuv. & Val., ii, 447, 1828 (Martinique); Günther, i, 203 (copied).

Mesoprion ricardi, Cuv. & Val., ii, 447, 1828 (Martinique).

Mesoprion ojanco, Poey, Memorias, ii, 150, tab. 13, f. 10, 1860 (Cuba); Poey, Synopsis, 295, 1868.

Lutjanus ojanco, Poey, Enumeratio, 1875, 28 (Cuba).

Head, $2\frac{1}{2}$ ($3\frac{1}{5}$); depth, $2\frac{1}{3}$ ($3\frac{2}{5}$). D. X, 12; A, III, 8. Scales, (6) 9–62–14; 50 pores. Length of a specimen from Cuba, 10 inches.

Body rather elongate, strongly compressed, the back well elevated, profile almost straight or slightly concave from tip of snout to nape, thence moderately convex. Snout rather slender and pointed, 3 in head. Eye large, $3\frac{2}{3}$ in head. Interorbital area flattish, with a median keel, 6 in head. Preorbital rather broad, its least width $6\frac{1}{3}$ in head. Mouth large, maxillary reaching front of pupil, $2\frac{1}{2}$ in head. Lower jaw strongly projecting; upper jaw with a narrow band of villiform teeth, outside of which is a single series of enlarged but comparatively small teeth; 4

moderate canines in front of jaw, two of them larger, about two in diameter of pupil. Lower jaw with a single series of rather small teeth, none of them at all canine-like. Tongue with an oblanceolate patch of teeth, tapering behind, its length more than twice its width. Vomer with a broadly arrow-shaped patch of teeth, with backward prolongation on median line, its length about equaling width of patch in front. Pterygoid and hyoid bones without teeth. Gill-rakers numerous, about ten developed on lower part of arch, besides four or five rudimentary ones, those near angle largest, their length almost one-half diameter of eye. Preopercle with its posterior margin almost vertical, broadly and rather deeply emarginate, very weakly or scarcely serrate above, the angle projecting backward and armed with several rather coarse teeth, the lower limb smooth.

Scales rather small, those below lateral line somewhat larger, the rows above the lateral line running obliquely upward and backward, those below in almost straight horizontal series. Cheeks with 6 rows of scales, 1 row on interopercle, 1 on subopercle, and 7 on opercle. Temporal region with a band of small scales, before and behind which is a series of larger ones. Top of head, snout, and jaws naked. Base of soft dorsal and anal scaly.

Dorsal spines rather weak and slender, the outline of the fin rather strongly convex; the fourth spine longest, $2\frac{1}{7}$ in head; the tenth spine 4 in head. Margin of soft dorsal very gently convex, the first and last rays slightly shorter than rest of fin; median rays $3\frac{1}{3}$ in head. Caudal not deeply forked, the upper lobe little longer than lower, its length $1\frac{2}{3}$ in middle rays, which are $2\frac{1}{3}$ in head. Margin of anal little rounded, the middle rays $1\frac{2}{3}$ length of last ray, 3 in head; the first ray reaching almost to tip of last ray when the fin is depressed. Anal spines small, the second as long as third and stronger, $4\frac{2}{3}$ in head. Ventrals $2\frac{1}{3}$ in head. Pectorals scarcely reaching front of anal, $1\frac{1}{3}$ in head. Color in life deep brown, silvery below, everywhere shaded with red, especially on head. Eye scarlet. A large blackish blotch on side, chiefly above lateral line and below first rays of soft dorsal. Maxillary yellow on covered parts. Narrow bronze streaks following the rows of scales, these streaks distinct chiefly above the lateral line. Dorsal fin pale, edged with blood-red; caudal deep red; anal, ventrals, and pectorals scarlet. The bright colors fade and disappear in spirits, leaving the back dark gray, the lower parts silvery, more or less flushed with red.

This species is rather common in the markets of Havana, where it is known as *Ojanco*, in allusion to the large size of the eye. It does not reach a large size.

This is, of course, the species described by Poey under the name of *Lutjanus ojanco*. There seems to be little room for doubt that the *Mesoprion mahogoni* and *ricardi* of Cuv. & Val. are of the same species. In coloration and in the small number of rays in the soft dorsal the agreement is perfect, and the scanty descriptions contain little else.

This species is one of the best marked of the genus, not strongly resembling any other.

15. Lutjanus vivanus. *Red Snapper; Pargo colorado; Pargo Guachinango; Silk Snapper.*

? Acara aya, Marcgrave, Hist. Brasil, 167, 168, 1648.

? Bodianus aya, Bloch, Ichthyol., taf. 227, about 1797 (based on Marcgrave); ? Lacépède, iv, 286, 287, 1803 (copied).

Lutjanus aya, Goode, Bull. U. S. Nat. Mus., v, 1876, 55 (Bermudas).

? Bodianus ruber, Bloch & Schneider, Syst. Ichthy., 1801, 330 (based on Marcgrave).

Mesoprion vivanus, Cuv. & Val., ii, 454, 1828 (Martinique; young specimens).

Lutjanus vivanus, Jordan, Proc. Ac. Nat. Sci. Phila., 1883, 286 (redescription of types).

Mesoprion campechanus, Poey, Mem., ii, 149, 1860 (Cuba).

Lutjanus campechianus, Poey, Synopsis, 294, 1868 (Cuba); Poey, Ann. Lyc. Nat. Hist. N. Y., 317, 1870 (Cuba); Poey, Enumeratio, 29, 1875 (Cuba); Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West); Jordan & Gilbert, Synopsis Fishes North America, 1883, 921 (copied); Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Lutjanus torridus, Cope, Trans. Am. Philos. Soc., 468, 1869 (St. Kitt's).

Lutjanus blackfordi, Goode & Bean, Proc. U. S. Nat. Mus., 176, 1878 (Pensacola); Goode, Proc. U. S. Nat. Mus., 114, 1879 (St. John's River); Goode & Bean, *op. cit.*, 1879, 137, 156 (Pensacola); Bean, *op. cit.*, 1880, 96; Goode & Bean, *op. cit.*, 1882, 238; Jordan & Gilbert, *op. cit.*, 1882, 275 (Pensacola); Jordan & Gilbert, Syn. Fishes North America, 1883, 549; and of recent American writers generally.

Habitat.—Pensacola to Aspinwall and the Lesser Antilles.

Head, $2\frac{3}{5}$ ($3\frac{2}{5}$); depth, $2\frac{3}{5}$ ($3\frac{2}{5}$). D. X, 14; A. III, 9. Scales, (7) 8–60–15; pores 46. Length of a specimen from Key West, 16 inches.

Body rather deep, moderately compressed, the back well elevated, profile steep and almost straight from snout to nape. Snout rather pointed, $2\frac{4}{5}$ in head. Eye moderate, $5\frac{1}{2}$ in head (larger in young). Interorbital space angulate or strongly convex, 5 in head. Occipital keel strong. Preorbital rather broad, 5 in head. Mouth rather large, maxillary reaching front of orbit, $2\frac{1}{2}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a row of larger but comparatively small teeth; 4 canines in front, two (sometimes duplicated) of them larger, their length about one-third diameter of eye. Lower jaw with a single row of rather small teeth, usually largest on side of jaw, where some of them are almost canine-like. Within these is a very narrow band of villiform teeth in front of jaw only. Tongue with a broad oval patch of teeth, scarcely twice as broad as long; in front of this patch is a small irregular patch. Vomer with a broadly arrow-shaped patch, with a rather short backward prolongation on median line, its length about equaling width of patch in front. Gill-rakers moderate, their length about one-half diameter of eye, 8 on lower arch. Preopercle with its posterior margin about vertical, its emargination deep, its edge rather finely serrate above, coarser at the angle, dentate on the lower border.

Scales rather large, the rows horizontal below lateral line, the rows above running backward and upward; 6 rows of scales on cheek, 1 on interopercle, 1 on subopercle, and 7 on opercle. Base of soft dorsal and anal scaly. Pores of lateral line branched. Temporal region with a broad band of scales, with a few scattering ones below it. Top of head, snout, and jaws naked.

Dorsal spines rather strong, the outline of the fin moderately convex; the fourth and fifth spines longest, $2\frac{1}{3}$ in head; the tenth spine about 4 in head. Margin of soft dorsal nearly straight, the fin pointed behind; the middle rays little longer than first ray, $1\frac{1}{2}$ length of last, 3 in head. Caudal lunate, the upper lobe scarcely longer than lower, its length $1\frac{2}{3}$ times length of middle rays, which are $1\frac{6}{7}$ in head. Margin of anal strongly angulate, the middle rays reaching nearly to base of caudal, $2\frac{1}{2}$ length of last ray, $1\frac{1}{3}$ in head; the first ray reaches about to middle of last ray when the fin is depressed. Anal spines strong, the second scarcely as long as third, 4 in head. Ventrals $1\frac{1}{3}$ in head. Pectorals reaching almost to middle of anal fin, $1\frac{1}{3}$ in head.

Color in life deep rose-red, paler on throat, bluish streaks along rows of scales, above becoming fainter and disappearing with age. Fins brick-red; dorsal bordered with orange, with a narrow blackish edge; caudal narrowly edged with blackish. Eye red. A large blackish blotch above lateral line and below front rays of soft dorsal in young specimens, this spot disappearing with age. Axil of pectoral dusky.

The young specimens which formed the types of *Mesoprion vivanus*, very scantily described by Cuv. & Val., have been thus redescribed (Jordan, Proc. Ac. Nat. Sci. Phila., 1883, 286):

Head, $2\frac{2}{3}$ in length; depth, $3\frac{1}{6}$. D. X, 14; A. III, 8. Lateral line with 50 pores.

Maxillary $2\frac{1}{3}$ in head. Teeth rather strong; vomerine teeth in an arrow-shaped patch, being prolonged considerably backward on the median line. Posterior nostrils oval. Eye 4 in head. Nuchal scales in a band, scarcely separated from the scales of the body; scales above lateral line arranged in oblique series. Second anal spine long, $2\frac{1}{2}$ in head. Caudal concave, the inner lobe $1\frac{2}{3}$ in the outer.

Color reddish, faintly streaked with olive; traces of a blackish blotch under soft dorsal; tips of middle rays of caudal dusky.

These are rather slenderer than any young Florida specimens which we have seen, but they agree fairly in this regard with some young "Silk Snappers" brought by Mr. Gilbert from Aspinwall.

The species is very abundant in rather deep water in rocky places around the Florida coast. At Pensacola it is taken in great numbers. It is one of the most important food-fishes of our Southern coasts. About Key West it is also taken in large numbers, but only in the deeper waters, and it is taken thence alive in the wells of the fishing-smacks to the markets of Havana. On the American coast it is known everywhere as Red Snapper, or to the Spaniards as *Pargo Colorado*. In Havana it bears the name of *Pargo Guachinango*, "Mexican Snapper,"

because it is brought to that city from the Mexican coast. According to Poey it is comparatively rare in Cuban waters, although daily seen in the markets. Its synonymy is somewhat complicated, and some doubt exists as to the proper specific name.

We place here with doubt the names *aya* and *ruber*, based on the *Acara Aya* of Maregrave. This is said to be a red *Lutjanus*, 3 feet in length, and with a red circle around its iris. It is therefore much more likely to have been this species than the *Lutjanus profundus*, with which it has been identified by Cuvier. It seems to us, however, that this identification is too uncertain to warrant the use of the name for either species.

The name *vivanus* is based on two young specimens which Professor Jordan has examined and which he considers to belong to this species, although, as already stated, these specimens are, for this species, unusually slender.

The type of *Mesoprion campechianus* is a stuffed skin of a young fish apparently belonging to this species. In this specimen the eye is larger than it should be in a Red Snapper of that size, it being, as Poey has correctly stated, 4 in head. This large size is, however, probably due to the shrinkage of the orbit in drying.

Poey also counts "65 scales above the lateral line and 53 below," a larger number than others count in this species. This difference is doubtless dependent on the method of counting.

Lutjanus torridus, loosely described and poorly figured by Cope, seems to be also the Red Snapper.

We have examined Professor Cope's type of *Lutjanus torridus* in the Museum of the Academy at Philadelphia. It is 11 inches in length and in poor condition, but it apparently belongs to this species. In life it was probably red, with the posterior edge of the caudal narrowly black; no evident black lateral spot.

Head, 3; depth, $3\frac{2}{5}$. D. X, 14; A. III, 8. Scales (7) 11–58–x; 53 pores.

Maxillary $2\frac{1}{2}$ in head, extending to past the front of the large eye, which is 4 in head. Preopercle strongly serrate. Dentition and gill-rakers as above described in *L. vivanus*. Longest ray of anal half head, the fin mesially elevated as in *L. vivanus*. Second anal spine $2\frac{3}{4}$ in head.

The type of *Lutjanus blackfordi* is of course specifically identical with the specimens which form the basis of the above descriptions. The description published under this name by Goode & Bean is the first tolerable account of this most valuable food-fish. We regret, therefore, our inability to retain the appropriate name which these authors have bestowed on the species.

16. Lutjanus analis. *Mutton-fish; Pargo; Pargo Criollo.*

Anthias Quartus Rondeleti (the Mutton-fish), Catesby, Nat. Hist. Carolina, 1743.

Mesoprion analis, Cuv. & Val., ii, 452, 1828 (San Domingo); Poey, Mem., ii, 146, 1860, tab. 13, fig. 9 (Cuba); Poey, Repertorio, i, 266, 1867 (Cuba); Poey, Synopsis, 294, 1868 (Cuba).

Lutjanus analis, Poey, Enumeratio, 1875, 29 (Cuba); Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West); Vaillant & Bocourt, Miss. Sci. au Mexique, 1881 (?), 119, pl. v.

Mesoprion sobra, Cuv. & Val., ii, 453, 1828 (Martinique); Guichenot, in Ramon de la Sagra, Hist. Cuba, Poiss., 22; Günther, i, 209.

Mesoprion isoodon, Cuv. & Val., ix, 443, 1833 (San Domingo).

Mesoprion isodon, Günther, i, 1859, 206 (copied).

Mesoprion vivanus, Günther, i, 263, 1859 (Jamaica; Bahia; not of Cuv.; & Val.).

Lutjanus vivanus, Cope, Trans. Am. Philos. Soc., 1869, 470 (New Providence; St. Croix).

? *Mesoprion rosaceus*, Poey, Ann. Lyc. Nat. Hist. N. Y., ix, 317, 1870 (Cuba).

? *Lutjanus rosaceus*, Poey, Enumeratio, 1875, 30.

Habitat.—Florida Keys to Brazil.

Head, $2\frac{2}{3}$ ($3\frac{3}{5}$); depth, $2\frac{2}{3}$ ($3\frac{3}{5}$). D. X, 14; A. III, 8. Scales, (7) 10–67–17; pores 51. Length of an individual from Key West, 11 inches.

Body rather deep and compressed, the back rather strongly elevated, profile steep and nearly straight from snout to nape. Snout rather long and pointed, $2\frac{3}{5}$ in head. Eye rather small, $5\frac{2}{5}$ in head in specimens a foot in length. Interorbital space gently convex, $5\frac{2}{5}$ in head. Occipital keel moderate. Preorbital very broad, its least width 4 in head. Mouth moderate; maxillary scarcely reaching front of orbit, $2\frac{2}{7}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a single series of larger but small teeth; 6 rather strong canines in front, 4 of them larger, about equaling in length one-half diameter of pupil. Lower jaw with a narrow villiform band in front only and a series of larger teeth outside; these unequal, largest on side of jaw, some of them almost canine-like. Tongue with a single very small patch of teeth on its middle; this is wanting in young examples. Teeth on vomer forming a broadly ∧-shaped patch, without backward prolongation on median line. Gill rakers moderate, one-half length of diameter of eye, about 8 on lower arch, with no rudiments before them. Preopercle with its posterior margin almost straight, slanting gently downward and forward; the notch broad and very shallow. Edge of preopercle rather coarsely serrate, most so at the angle. Scales small, the rows almost horizontal below the lateral line, running backward and upward above. Tubes of lateral line branched. About 7 rows of scales on the cheeks; 1 row on interopercle, 1 on suboperele, and about 9 on opercle. Temporal region with about eight rows of scales, which become smaller posteriorly. Base of soft dorsal and anal scaly.

Dorsal spines weak and slender, the outline of the fin not greatly curved; the fourth spine longest, $2\frac{2}{3}$ in head; the tenth spine $3\frac{1}{3}$ in head. Margin of soft dorsal angulate; the ninth ray longest, twice last and $1\frac{1}{2}$ times first ray, 2 in head. Caudal well forked; upper lobe the longest, $1\frac{2}{5}$ length of middle rays, which are about $2\frac{1}{6}$ in head. Anal angular, similar to soft dorsal, the middle rays more elevated than in any other species, longest $2\frac{1}{4}$ length of last, 2 in head; first ray nearly reaching tip of last when the fin is depressed; the second and third anal spines

rather strong, of equal length, $3\frac{3}{4}$ in head. Ventrals $1\frac{2}{3}$ in head. Pectorals reaching slightly past origin of anal, $1\frac{3}{10}$ in head.

Color in life, dark olive-green above; many of the scales with pale blue spots, these forming irregular oblique streaks upward and backward; similar stripes more regular and numerous on caudal peduncle, and above anal. In old fishes these blue spots and streaks disappear. Belly, white, strongly tinged with brick-red; about six narrow, dusky, vertical bars, a little broader than the interspaces and not well-defined between gill-opening and anal. Head, bronze-olive, darker above; a broad, undulating, pearly streak from snout below eye to upper edge of gill-opening; a narrow blue streak from eye to nostrils; iris, fiery red. Pectorals, caudal, anal, and ventrals, brick-red, the caudal narrowly margined with black and a little bronzed above. Dorsal, reddish along the rays and tips of membranes, otherwise yellowish; lateral blotch just above the lateral line, and below the first soft ray of dorsal distinct, about as large as pupil, smaller than in other species similarly marked, and seldom disappearing with age. Axil and bar across base of pectoral above pale or dusky olive. In spirits the markings become fainter, the lateral blotch and the bluish streaks on head usually persisting.

This species is rather common at Key West, where, as elsewhere in the West Indies, it is known as Mutton-fish. At Havana it is the *Pargo* (*par excellence*) or *Pargo Criollo*. It is perhaps the most important food-fish of the Havana markets, being always abundant, and its flesh always healthful. It reaches a large size, and its flesh is fairly flavored, although not very delicate.

The names *analis* and *sobra* of Cuv. & Val. seem to belong to this species without question. *Mesoprion isodon* is identified by Vaillant with *L. analis* on comparison of typical examples. *Lutjanus rosaceus* is described as a distinct species from a large specimen $27\frac{1}{2}$ inches in length. The only tangible distinction which we find in the long description is that the eye is one-sixth the length of the head, while in *L. analis* of the same size the eye is $8\frac{1}{2}$ in the head.

We hesitate to admit *L. rosaceus* as distinct from *L. analis*. The larger eye and redder coloration perhaps indicate a specimen from deeper water than usual.

17. Lutjanus colorado. *Pargo colorado.*

Lutjanus colorado, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 338, 351, 355 (Mazatlan); Jordan & Gilbert, Bull. U. S. Nat. Mus., 1882, 107, 110 (Mazatlan; Panama).

Habitat.—Mazatlan and Panama.

This species, the Pacific representative of *Lutjanus analis*, is rather common along the Pacific coast from Mazatlan to Panama. It is a good food-fish and reaches a considerable size. At Mazatlan, it is known as "*Pargo Colorado*," which in English would be "Red Snapper." The original description already published in these proceedings need not now be repeated.

18. Lutjanus cyanopterus.

Mesoprion cyanopterus, Cuv. & Val., ii, 472, 1828 (Brazil).
Mesoprion pargus, Cuv. & Val., ii, 473, 1828 (Puerto Rico).

Habitat.—Brazil; West Indies.

We know nothing either of *cyanopterus* or *pargus* except from the descriptions of Cuv. and Val. These descriptions seem to refer to a single species, allied to *L. buccanella*, but with the canines stronger and the black spot above the base of the pectoral. The soft parts of the vertical fins in "*cyanopterus*" are said to be bluish black. According to Vaillant and Bocourt this is one of the species which has the teeth on the vomer in a ∧ shaped patch, without backward prolongation on the median line. It has also teeth on the tongue.

19. Lutjanus lutjanoides.

Ocyurus lutjanoides, Poey, Ann. Lyc. Nat. Hist., ix, 319, 1871 (Cuba).
Lutjanus lutjanoides, Poey, Enumeratio, 1875, 30.

Habitat.—Cuba. One specimen known.

This species is known to us only from Poey's description. Its describer has suggested the possibility of its being a hybird between *O. chrysurus* and *L. caxis*.

The following is Poey's original description:

"The fish, if not undoubtedly belonging to the genus *Ocyurus* of Professor Gill, of which the *Mesoprion chrysurus* is the type, comes nearer to it than to any other genus, by the bifurcation of its caudal deeper than in *Lutjanus jocú*, *caxis*, *caballerote*, etc. The pointed snout and the long canines would bring it among these last. From its colors the fishermen are led to consider it a hybrid between the *M. chrysurus* and the *L. caxis*. They often thus dispose of a new fish, as in the case of the *Ocyurus ambiguus* and *aurovittatus*. But as such hybrids are rare among fish, and especially so among these genera, it is, I believe, right to consider the present species as a good one.

"Total length, 290 millimeters, or 11.45 inches. The height of the body, equal to the length of the head, is contained $3\frac{2}{3}$ times in the total length. The eye is rather high up, and half way from snout to tip of opercle. The nostrils are on the middle of the snout, rather wide apart, the posterior one oblong. The mouth is small, for the ends of the maxillaries are under the posterior nostril. The preopercle is only slightly notched, finely denticulated; the opercle without a spinous point. The teeth are in one row, the canines rather long, and behind them there are asperities; the palatine arch has teeth, and the tongue is rough.

"The lateral line has about fifty-five scales, six rows above and fifteen below it; there are scales on the opercles and temples, the rest of the head naked. The scapular bones show outside. There are very small scales on the interstitial base of the soft rays of the vertical fins. D. 10, 14. A. 3, 8.

"The posterior borders of the dorsal and anal are rounded. The caudal lobes are elongated, but less so than in the *M. chrysurus*. The

pectoral is pointed, contained 4½ times in the total length. The three first spiny rays of the dorsal gradually increase in length, the last, or tenth one, not longer than the preceding ones. The soft rays of the dorsal and anal are all branched and flattened. The color is a brownish green, the abdomen paler, six brown bands fall vertically from back over the sides; a broad and interrupted stripe of a greenish color extends from the upper part of the opercle to the base of the caudal, resembling *Ocyurus chrysurus* and *aurovittatus*.

"I have seen this fish but once, and I sent the specimen to the United States, either to Professor Agassiz or to Mr. Brevoort. It bears my No. 163."

20. Lutjanus inermis.

Mesoprion inermis, Peters, Berliner Monatsber., 1869, 705 (Mazatlan).
Lutjanus inermis, Jordan, Proc. Ac. Nat. Sci. Phila., 285, 1883 (Mazatlan).

Habitat.—Mazatlan.

The following notes are taken from Professor Peters's original type:

Head, 3 in length; depth, 3¼. Lateral line with 50 tubes. Scales 53. Dorsal X, 13; A., III, 11.

Body slender and fusiform, not strongly compressed, the back not elevated. Snout very pointed; mouth unusually small, the maxillary 2⅔ in head, reaching to front of pupil. Eye very large, about 4 in head. Band of vomerine teeth slightly produced backward on the median line. Teeth on tongue well developed; canine teeth unusually small and slender, 2 in upper jaw and 3 or 4 on each side of lower. Nostrils well separated, subequal, the posterior oblong, the anterior round. Preorbital two-fifths depth of eye. Preopercle not serrate, scarcely notched behind. Temporal region with a band of large scales, on each side of which are small scales. Scales above lateral line arranged in very oblique series, which are not parallel with the lateral line.

Pectoral fins very short, reaching little past tips of ventrals, 1¾ in head. Dorsal spines very slender. Second anal spine longer than third, very small, 7 in head. Soft dorsal and anal low, scaly. Caudal fin rather deeply forked, the middle rays not half the length of the outer, which are 1⅓ in head.

Color in spirits, dusky above, pale below, with distinct dark stripes, those below parallel with the lateral line, those above very oblique; these stripes extend along the edges of the rows of scales, the middle of each scale being whitish, its base dusky.

According to Peters, the color was violet brown; middle of each scale with a silvery shining spot; belly silvery. Base of pectoral above and below brown.

Only one specimen is known; it is in the museum at Berlin, and is said to have come from Mazatlan. It is quite unlike any other American species. It is, perhaps, related to *Lutjanus mitchelli*, a species lately described by Dr. Günther, from Madras.

21. Lutjanus aratus. *Pargo Raizero.*

Mesoprion aratus, Günther, Proc. Zool. Soc. Lond., 1864, 145 (Panama; Chiapam); Vaillant & Bocourt, Miss. Sci. au Mexique, 1881, 122 (Chorera, near Panama).

Lutjanus aratus, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1881, 355; Jordan & Gilbert, *op. cit.*, 1882, 625 (Panama); Jordan & Gilbert, Bull. U. S. Nat. Mus., 1882, 107, 110, 112 (Mazatlan; Panama; Punta Arenas).

Habitat.—Mazatlan to Panama.

Head, 3 ($3\frac{4}{5}$); depth, $3\frac{1}{5}$ ($4\frac{1}{10}$). D. XI, 12; A. III, 7. Scales, $4\frac{1}{2}$–45–12. Length (28239, Mazatlan), $15\frac{1}{3}$ inches.

Body oblong-elliptical, slenderer and less compressed than in most species of *Lutjanus*, the back broad and little elevated. Profile a little depressed above the snout, then convex above the eyes, thence nearly straight to front of dorsal. Snout not very long, 3 in head. Mouth moderate, somewhat oblique, the jaws subequal. Maxillary extending to beyond front of eye, its length $2\frac{1}{3}$ in head. Teeth moderate; canines of upper jaw not very large; the enlarged teeth of lower jaw scarcely canine-like. Teeth on tongue in a large patch, developed in adult examples, but not evident in the young. Teeth on vomer in a ∧-shaped patch, without backward prolongation on the median line. Palatine teeth in a broad patch. No teeth on pterygoids.

Eye large, 5 in head; interorbital area broad and convex, its width 4 in head; preorbital moderate, its least breadth 6 in head. Nostrils small, well separated, oblong, the anterior but little the larger. Preopercle with its posterior limb slanting downwards and forwards, with a moderate emargination, sharply and finely serrate above, the teeth at the angle coarser and directed somewhat forwards. Gill-rakers few and rather small, about 7 on lower part of anterior arch, not preceded by rudiments.

Scales large, arranged very regularly in horizontal series parallel with the lateral line, both above and below. Cheeks with 6 rows of scales. Nape with a band of about 3 series of moderate scales. Soft dorsal and anal well scaled. Tubes of lateral line well branched.

Dorsal spines moderate, the longest $2\frac{2}{3}$ in head, soft dorsal rather low and short. Caudal rather deeply lunate, the upper lobe $1\frac{1}{6}$ in head. Anal low, its longest rays $2\frac{2}{5}$ in head. Anal spines graduated, the second spine shorter and stouter than third, about $5\frac{1}{2}$ in head. Pectoral long and falcate, $1\frac{1}{6}$ in head; ventrals $1\frac{5}{6}$.

Color, in spirits, dark brown; somewhat paler below; centers of each scale yellowish silvery, these forming conspicuous continuous silvery streaks along the back and sides, most distinct near the middle of the body. Fins grayish, rather pale; membrane of soft dorsal dusky; ventrals dusky at tips; young with pale cross-bands formed by enlargement of the silvery spots in certain regions.

In coloration, as in the arrangement of the scales, this species bears a strong resemblance to *Hæmulon maculicauda* of the same waters.

This species, the "*Pargo Raizero*" of the Mazatlan fishermen, is generally common on the Pacific coast, and reaches a considerable size. It bears little resemblance to any other American species, its squamation resembling that of *Hæmulon maculicauda*.

III.—Genus OCYURUS.

OCYURUS, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236 (*chrysurus*).

The skull of the single species now referred to *Ocyurus* deviates so far from that of the ordinary *Lutjanus* that its separation as a distinct genus seems to be fully justified. The species shows numerous minor peculiarities, as the peculiar form of the body, the large caudal fin, the small head, as well as an increased number of gill-rakers, and the presence (in the adult) of pterygoid teeth.

ANALYSIS OF SPECIES OF OCYURUS.

a. Gill-rakers long and numerous, about 20 developed on lower part of arch; mouth small, lower jaw projecting; canines small, in upper jaw only; body elliptical, elongate, with very slender caudal peduncle; caudal fin deeply forked, longer than head; eye small; occipital keel high; preorbital narrow; teeth on vomer in a ↑-shaped patch; adult with a narrow band of teeth on pterygoids; scales small, those above lateral line in very oblique series; soft dorsal and anal low; anal spines weak; olivaceous, somewhat rosy tinged; a broad yellow lateral band with yellowish blotches above it and some yellow streaks below it; caudal deep yellow; other fins mostly yellow ..... CHRYSURUS, 22.

22. Ocyurus chrysurus. *Yellow-tail; Rabirubia.*

Acara pitamba, Marcgrave, Hist. Brasil, 1648, 155.

Rabir ubbia, Parra, Descr. Dif. Piezas, Hist. Nat., pl. 20, f. 1, 1787 (Cuba).

Sparus chrysurus, Bloch, Ichthyol., taf. 262, about 1795 (after Marcgrave); Lacépède, Hist. Nat. Poiss., iv, 115, 1803 (copied).

Grammistes chrysurus, Bloch & Schneider, Syst. Ichthyol., 1801, 187 (copied).

Mesoprion chrysurus, Cuv. & Val., ii, 459, 1828 (Martinique); Guichenot, Ramon de la Sagra, Hist. Cuba, 24, about 1850 (Cuba); Günther, i, 186, 1859 (Puerto Cabello; Jamaica; Trinidad).

Ocyurus chrysurus, Gill, Proc. Ac. Nat. Sci. Phila. (name only); Poey, Synopsis, 295, 1868; Cope, Trans. Am. Philos. Soc., 1871, 468 (St. Martin's; New Providence; St. Croix); Poey, Enumeratio, 1875, 40 (Cuba); Poey, Bull. U. S. Fish Comm., 1882, 118 (Key West).

Lutjanus chrysurus, Vaillant, Miss. Sci. au Mexique, 1875, 133, pl. v, 1881; Jordan & Gilbert, Synopsis Fish. N. A., 1883, 921; Jordan, Proc. U. S. Nat. Mus., 1884, 125 (Key West).

Anthias rabirubia, Bloch & Schneider, Syst. Ichth., 1801, 309 (after Parra).

Sparus semiluna, Lacépède, Hist. Nat. Poiss., iv, 141, 1803 (on a copy of a drawing by Plumier).

Mesoprion aurovittatus, Agassiz, Spix, Pisc. Brasil, pl. 66, 1829 (Brazil).

Ocyurus aurovittatus, Poey, Synopsis Pisc. Cubens., 1868, 295; Poey, Enumeratio, 31 (Cuba).

Ocyurus melanurus, Goode, Proc. U. S. Nat. Mus., 1879, 114 (name only; after *Perca melanura*, L., which is a *Hæmulon* and not a *Lutjanus*).

Lutjanus melanurus, Jordan & Gilbert, Synopsis Fish. N. A., 1883, 548.

Ocyurus rijgersmal, Cope, Trans. Am. Phil. Soc., 1871, 468 (St. Kitt's).

Habitat.—Florida to Brazil.

Head, 3 (4¼); depth, 2⅞ (4⅛). D. X, 13; A. III, 9. Scales, (7) 10–65–15; 51 pores. Length of an example from Key West, 12 inches.

Body elliptical, comparatively elongate; the back little elevated; the profile straight from the tip of the snout to the nape, thence rather strongly arched: caudal peduncle long and slender; snout pointed, of moderate length, 3 in head; eye small, 5 in head; interorbital space very convex, with a sharp median keel, 4 in head; preorbital narrow, its least width 6⅔ in head.

Mouth small, oblique; lower jaw projecting; maxillary reaching very slightly beyond front of orbit, 2⅞ in head: upper jaw with a narrow band of villiform teeth, outside of which is a single series of larger teeth, 5 or 6 of those in front being somewhat canine-like, but small; lower jaw with a single series of moderately strong teeth, none of them large enough to be called canines; tongue with a large, oval patch of teeth, in front of which is a smaller but similar patch; teeth on vomer forming a broadly arrow-shaped patch, with a backward prolongation on the median line, which is nearly twice the width of the patch; a narrow band of pterygoid teeth behind the patch on the vomer, this not evident in young examples; gill-rakers rather long and slender, the longest about half diameter of eye, about 21 below angle of arch, none of them rudimentary.

Preopercle with its posterior margin almost vertical, with a slight but distinct emargination above the angle; serrations of preopercle very feeble, the teeth at the angle scarcely enlarged; nostrils well separated, the posterior slit-like; scales small, those above lateral line arranged in very oblique series, those below in rows nearly horizontal; cheeks with 5 or 6 rows of scales, about two rows on interopercle; temporal region with two or three series of large scales before and behind which are many small scales; top of head, snout, and jaws naked; bases of soft dorsal and anal scaly.

Dorsal spines rather long and slender, the fin not deeply emarginate; fifth spine longest, 2⅝ in head, tenth spine 3¾; soft dorsal and anal similar, their margins nearly [straight], the last rays slightly shortened; median rays about 3 in head; caudal fin long, very deeply forked, the upper lobe longest, three times as long as middle rays, which are 2½ in head; pectorals long and slender, almost reaching anal, 1⅛ in head; ventrals 1½ in head; anal spines rather weak, the third one-third longer than second, 4 in head.

Color in life olivaceous above, rather pale, and somewhat violet-tinged; a number of large, irregular deep yellow blotches on sides of back; a deep yellow stripe from tip of snout straight through eye to caudal peduncle, there broadening and including all of tail above lateral line and behind dorsal fin. Above this a pearly-purplish area; below it a flesh-colored or rosy area or band, two scales broad, then a succession of about 16 narrow streaks of alternating flesh-color and yellow,

growing fainter progressively below; the yellow on the edges of the scales, the reddish on their middles; iris fiery red. Lower parts of head flesh-color with some yellow spots; maxillary mostly yellow; caudal deep yellow, its edges reddish. Dorsal chiefly yellow; anal faintly yellow; ventrals and pectorals translucent. In spirits all the markings fade, leaving the fins yellowish, the upper parts grayish, the lower rosy-silvery.

This species is very abundant at Key West, where it is known as Yellow Tail. In Cuba it is perhaps next to *L. analis* and *L. synagris*, the commonest of the genus. It is there known as *Rabirubia*.

The synonymy of this species offers little difficulty. The earlier names, *chrysurus*, *rabirubia*, *semiluna*, seem to admit of no doubt. *Aurorittatus* is admitted as a distinct species by Poey, who has seen it but once, and distinguishes it by the absence of yellow spots on the back. Without further evidence, we cannot regard the claims of *aurorittatus* to distinction as worthy of consideration.

The use of the name *melanurus* for this species by Professor Goode is certainly an error. There can be no reasonable doubt of the pertinence of *Perca melanura*, L. to *Hæmulon melanurum* (*dorsale*, Poey).

The specimens from Saint Kitt's, described by Professor Cope, under the name of *Ocyurus rijgersmæi*, are without much doubt simply brightly colored adults of this species.

We have lately examined these specimens in the Museum of the Academy of Natural Sciences at Philadelphia. None of them have more than ten dorsal spines although twelve are counted by Professor Cope. In color they agree exactly with *O. chrysurus*, except that the yellow markings of that species are in the types of *O. rijgersmæi* replaced by brown; a change, doubtless, due to the action of the alcohol. In form, dentition, gill-rakers, scales, and fin-rays, they agree exactly. In one specimen the head is $3\frac{1}{4}$ in length, the depth $3\frac{1}{3}$; scales (7) 11—50—x. Maxillary, $3\frac{1}{2}$ in head, barely reaching front of eye. D. X, 13; A. III, 9. Eye, 5 in head. Second anal spine, 5; caudal, 3 in body; pectoral, $3\frac{1}{2}$.

IV.—Genus RHOMBOPLITES.

RHOMBOPLITES, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 237 (*aurorubens*).

This genus is closely allied to *Lutjanus*, but the cranial peculiarities and extension of the villiform teeth over the pterygoid and hyoid bones seem to warrant generic separation. The form of the vomerine patch of teeth is also somewhat peculiar. But one species is known.

ANALYSIS OF SPECIES OF RHOMBOPLITES.

a. Eye large, $3\frac{1}{2}$ to 4 in head; scales small, 72 in a longitudinal series; gill-rakers numerous; dorsal spines twelve; caudal rather deeply forked; color vermilion red, with golden streaks ..... AURIRUBENS, 23.

23. Rhomboplites aurirubens. *Cagon de lo Alto.*

Centropristis aurorubens, Cuv. & Val., Hist. Nat. Poiss., iii, 45 (Brazil; Martinique; San Domingo); Storer, Synopsis, 1846, 288 (copied).

Mesoprion aurorubens, Günther, i, 207, 1859 (Jamaica).

Rhomboplites aurorubens, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 236; Goode & Bean, Proc. U. S. Nat. Mus., 1879, 136 (Charleston; Pensacola); Bean, Proc. U. S. Nat. Mus., 1880, 96 (Charleston); Jordan, Proc. U. S. Nat. Mus., 1884 (Pensacola).

Lutjanus aurorubens, Vaillant & Bocourt, Miss. Sci. au Mexique, 1875; Jordan & Gilbert, Synopsis Fish. N. A., 1883, 549.

Mesoprion elegans, Poey, Memorias, ii, 153, 1860 (Cuba).

Rhomboplites elegans, Poey, Repertorio, ii, 158, 1868; Poey, Synopsis, 1868, 295; Poey, Enumeratio, 1875, 31.

Aprion ariommus, Jordan & Gilbert, Proc. U. S. Nat. Mus., 1883, 142 (Pensacola).

Head, $3\frac{1}{6}$ (4); depth, $3\frac{1}{6}$ (4). D. XII, 11; A. III, 8. Scales (7), 10–72–19; 50 pores. Length of a specimen from Cuba, $12\frac{1}{2}$ inches.

Body elongate, irregularly elliptical, the back not greatly elevated, highest at the nape; profile regularly and strongly convex from above eye to spinous dorsal. Snout rather short and bluntish, $3\frac{2}{3}$ in head, its upper profile straight and steep. Eye very large, $3\frac{3}{4}$ in head. Interorbital space very convex, $3\frac{1}{2}$ in head; preorbital narrow, its least width $7\frac{1}{2}$ in head. Mouth small, oblique, the lower jaw somewhat projecting. Maxillary scaleless, reaching front of orbit, $2\frac{2}{7}$ in head. Upper jaw with a broad band of villiform teeth, outside of which is a row of enlarged but comparatively small teeth; no canines. Lower jaw with one series somewhat stronger than outer teeth of upper jaw; inside of these is a rather broad villiform band of teeth in front of jaw only. Tongue with a very broad irregularly ovate patch of teeth, its width almost as great as width of tongue, $1\frac{1}{2}$ in its length; in front of this patch is a large roundish patch of teeth; an oblong patch of teeth on the hyoid bone. Vomer with a rhomboid (◇-shaped) patch of teeth, forming almost a right angle in front, with a broadly wedge-shaped backward prolongation on the median line, its length about twice its width. Palatine band of teeth very wide. Pterygoids with a large patch of teeth; these teeth undeveloped and covered by skin in young examples. Gill-rakers numerous, the longest about one-half diameter of eye; about 21 on lower part of arch. Preopercle with posterior margin almost straight and vertical, slightly emarginate, weakly serrate above, the teeth coarser at the angle and on lower border. Posterior nostril largest; nearly round. Scales very small, the rows above the lateral line running upward and backward, the rows below rather wavy, almost horizontal. Temporal region covered with small partially imbedded scales, in 4 or 5 rows; cheeks with 7 rows of scales; 4 rows on interopercle, 3 rows on subopercle, and 7 on opercle. Snout, preorbital, and jaws naked; top of head scaly to near middle of eye. Soft dorsal and anal with but few scales at base.

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Dorsal spines long and slender, the fourth spine longest, $2\frac{1}{4}$ in head, the length of the spines thence gradually decreasing to twelfth spine, which is $3\frac{1}{3}$ in head. Margin of soft dorsal truncate, its rays of subequal length, 4 in head; last ray slightly shorter. Caudal deeply forked, the upper lobe longer than lower, its length $1\frac{3}{4}$ times middle rays, which are 2 in head; upper lobe of caudal scarcely shorter than head. Anal similar to soft dorsal, its rays 3 in head; second anal spine shorter than third, 4 in head. Ventrals $1\frac{1}{2}$ in head. Pectorals somewhat falcate, reaching opposite vent, $1\frac{1}{5}$ in head.

Color in life, vermilion; paler below. Faint brown lines running obliquely forward and downward from dorsal along the rows of scales. Sides with narrow sinuous streaks of golden yellow, some of them longitudinal, others oblique. Dorsal rosy, its margin chiefly orange; anal pale at base, rosy at extremity; pectorals yellowish, ventrals rosy, caudal vermilion; iris vermilion red; inside of mouth dusky.

The bright colors grow faint or disappear in spirits.

This species is not uncommon in deep water as far north as Charleston and Pensacola. It is not unfrequently seen in the markets of Havana, where it is known as *Cagon*, or *Cagon de lo Alto*. Specimens from Pensacola and Havana are fully identical.

Specimens from the coast of South Carolina are somewhat deeper than those from Cuba, and with the yellow streaks more pronounced, becoming dark brown in spirits. One of these, in the U. S. National Museum, has 13 dorsal spines. It is not, however, otherwise essentially different.

We see no reason to doubt that this species is the original *Centropristis aurorubens* of Cuv. & Val. We therefore adopt the earlier name instead of the name *elegans*, given to it by Poey.

The young specimens taken from stomachs of red snappers, at Pensacola, and described by Jordan and Gilbert as *Aprion ariommus*, seem to be the young of this species. The pterygoid teeth are undeveloped, and covered by skin in young examples.

V.—Genus TROPIDINIUS.

?Apsilus, Cuv. & Val., Hist. Nat. Poiss., vi, 1830, 548 (*fuscus*).

Tropidinius, (Gill MSS.), Poey, Synopsis Piscium Cubensium, 1868, 296 (*armillo* = *dentatus*).

This very distinct genus has essentially the cranial structure of *Lutjanus*, with the scaleless fins, peculiar squamation and dentition of *Aprion*. But one species of the genus is as yet known, although it is possible that the same characters may be found to exist in *Apsilus fuscus*. The description of the latter species does not seem to indicate any very close relation to *Tropidinius dentatus*. We may therefore regard *Tropidinius* as generically different from *Apsilus*.

ANALYSIS OF SPECIES OF TROPIDINIUS.

a. Scales small, regularly arranged, those above lateral line in series parallel with the lateral line; gill-rakers numerous, about 17 on lower part of arch; mouth rather small, the canines moderate; tongue toothless; vomerine teeth in a Λ-shaped patch; caudal well forked; dorsal spines 10; last rays of anal slightly produced; body rather deep (depth, $2\frac{2}{3}$ in length); head large; caudal dusky violet, without distinct markings..... DENTATUS, 24.

24. Tropidinius dentatus. *Arnillo.*

Apsilus dentatus, Guichenot, in Ramon de la Sagra, Hist. Cuba, Poiss., 29, pl. 1, f. 2, 1845.

Mesoprion dentatus, Günther, i, 188, 1859 (Jamaica).

Mesoprion arnillo, Poey, Mem., ii, 154, 1860 (Cuba).

Tropidinius arnillo, (Gill MSS.) Poey, Synopsis, 296, 1868 (Cuba); Poey, Enumeratio, 30, 1875.

Lutjanus arnillus, Cope, Trans. Am. Philos. Soc., 470, 1869 (St. Croix).

Habitat.—Cuba; Jamaica; St. Croix.

Head, 3 ($3\frac{2}{10}$); depth, $2\frac{5}{7}$ ($3\frac{1}{2}$). D. X, 10; A. III, 8. Scales, (7), 7–60–16; 60 pores. Length of an example from Cuba, $11\frac{1}{2}$ inches.

Body rather deep, oblong, elliptical, compressed, the back somewhat elevated; profile, from snout to nape, little convex; the nape strongly keeled and considerably convex. Snout rather short and blunt, $3\frac{1}{2}$ in head. Eye large, $3\frac{2}{3}$ in head. Interorbital space convex, $3\frac{1}{3}$ in head, its median line becoming on the occiput a sharp keel. Preorbital very narrow, $7\frac{2}{3}$ in head. Mouth small. Maxillary broad, almost reaching pupil, $2\frac{1}{2}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a series of larger, which are scarcely large enough to be called canines. Lower jaw with a single series of small teeth, about 6 of those in front larger, scarcely canine-like, similar to the larger teeth of upper jaw. Inside of this series is a comparatively wide band of villiform teeth in front of jaw only. Tongue without teeth. Vomer with a Λ-shaped patch of teeth, without backward prolongation on median line. Gill-rakers numerous, the longest two-fifths diameter of eye, about 17 on lower half of arch. Preopercle with its posterior margin nearly vertical, very slightly emarginate, scarcely serrate except at angle, where the teeth are quite small.

Scales rather small, very regularly arranged, the rows running parallel with the lateral line both above and below; 7 rows on cheek, the scales of upper row little enlarged, two rows on interopercle, $1\frac{1}{2}$ on subopercle, 6 on opercle. Temporal region with four rows of moderate scales; top of head, snout, and jaws naked. Base of soft dorsal and anal scaleless.

Dorsal fin not strongly emarginate, the spines rather slender, the outline of the fin rather strongly convex; 4th spine longest, $2\frac{1}{3}$ in head, 10th spine $3\frac{1}{4}$ in head. Margin of soft dorsal gently rounded, the middle rays little longer than first rays, $2\frac{1}{7}$ in head; last ray not shorter than middle rays. Caudal deeply forked, the upper lobe slightly longer than lower, $2\frac{1}{4}$ length of middle rays, which are $2\frac{1}{4}$ in head. Upper lobe about as long as head. Margin of anal nearly straight, the

rays about of equal length, except the last, which is somewhat produced, 2½ in head; first ray reaching about to base of last ray, when the fin is depressed; anal spines rather weak, the third rather longest, 3 in head. Ventrals, 1½ in head. Pectorals somewhat falcate, reaching first soft ray of anal, about as long as head.

Color in life, dusky violet, paler below. Mouth within and fins all similar in hue, the anal and ventrals with blackish tips; soft dorsal, with some olive shades, the edge grayish. In spirits, nearly uniform dusky gray, paler below.

This beautiful little fish is rather common in the markets of Havana, where it is known as *arnillo*.

The peculiarly unfortunate name *dentatus* is set aside by Poey in favor of his later name, *arnillo*, because the species is a *Lutjanus* and not an *Apsilus*, and all the *Lutjani* are dentate. Such reasons are not sufficient to warrant interference with the law of priority.

VI.—Genus APRION.

Aprion, Cuv. & Val., Hist. Nat. Poiss., vi, 1830, 543 (*virescens*).
? Apsilus, Cuv. & Val., Hist. Nat. Poiss., vi, 1830, 548 (*fuscus*).
Chletopterus, Temminck & Schlegel, Fauna Japonica, Poiss., 78, 1850 (*dubius*).
Pristipomoides, Bleeker, Natuurk. Tijdschr. Nederl. Ind., 1852, iii, 574 (*typus*).
Platyinius, Gill, Proc. Ac. Nat. Sci. Phila., 1863, 237 (*vorax=macrophthalmus*).
Sparopsis, Kner, Fische Mus. Godeffroy, 1868, 303 (*elongatus*).

We accept this genus as defined by Bleeker, who gives a synonymy similar to that above. The superficial characters separating it from *Lutjanus* are not very important, but the structure of the upper part of the cranium (in the only species examined, *macrophthalmus*) differs most widely from that of *Lutjanus*, *Ocyurus*, and *Rhomboplites*, closely resembling that of *Etelis*, with which genus *Aprion* has very near affinities.

The American species (*macrophthalmus*) has been made by Professor Gill the type of a genus *Platyinius*, regarded as distinct from *Aprion*. The skull of *Aprion virescens* has never been examined. It may or may not agree with that of *Platyinius*, but, in our opinion, there is, as yet, no sufficient reason to doubt the close affinity of *A. macrophthalmus* with *A. virescens*.

ANALYSIS OF SPECIES OF APRION.

a. Scales large, regularly arranged, those above lateral line in series parallel with the lateral line; gill-rakers numerous, about 17 on lower part of arch; mouth rather small, the canines feeble; tongue toothless; vomerine teeth in a Λ-shaped patch; caudal well forked; dorsal spines ten; body oblong-elliptical, the depth 3 in length; last ray of dorsal and anal produced; color rose-red, with some pearly markings ..... Macrophthalmus, 25.

25. Aprion macrophthalmus. *Voraz.*

Centropristis macrophthalmus, Müller & Troschel, in Schomb. Hist. Barbadoes, 666, 1848 (young).

Elastoma macrophthalmus, Cope, Trans. Am. Philos. Soc., 468, 1869 (St. Martin's; New Providence; St. Croix).

Mesoprion vorax, Poey, Mem., ii, 151, 1860 (Cuba).

Platyinius vorax, Gill, Proc. Acad. Nat. Sci. Phila., 1862 (generic diagnosis); Poey, Synopsis, 292, 1868, Poey; Enumeratio, 31, 1875.

Habitat.—Barbadoes; St. Martin's; New Providence; St. Croix; Cuba.

Head, 3 ($3\frac{3}{4}$); depth, 3 ($3\frac{3}{4}$). D. X, 11; A. III, 8. Scales, (7) 7–60–15; 52 pores.

Body oblong-elliptical, moderately compressed; the back not greatly elevated; profile convex anteriorly, almost straight above eye; the nape again convex, its keel low and placed well back. Snout rather blunt, $3\frac{3}{5}$ in head. Eye large, $3\frac{2}{5}$ in head. Interorbital space broad and flat, 4 in head. Preorbital narrow, $7\frac{1}{2}$ in head; mouth small, oblique; lower jaw slightly projecting. Maxillary about reaching middle of eye, $2\frac{1}{3}$ in head. Upper jaw with a narrow band of villiform teeth, outside of which is a row of larger teeth, the canines in front little differentiated. Lower jaw with a single series of rather large teeth, scarcely large enough to be called canines; inside of this series is a comparatively wide band of villiform teeth in front of jaw only; a few larger teeth among the villiform teeth. Tongue without teeth. Vomer with a rather narrow Λ-shaped patch of teeth, without backward prolongation on median line. Gill-rakers numerous, the longest about two-fifths diameter of eye, 15 on lower part of arch. Preopercle with posterior margin almost straight and vertical, without emargination, very finely serrate above; the teeth coarser on angle and lower limb.

Scales rather small, regularly arranged; the rows running parallel with the lateral line both above and below it; 7 rows of scales on the cheek, the scales of upper row not greatly enlarged, two rows on interopercle, and 8 on opercle. Temporal region with about 4 rows of large scales; top of head, snout, and jaws naked. Base of soft dorsal and anal scaleless.

Dorsal little emarginate; the spines rather slender; the outline of the fin moderately convex; third spine longest, $2\frac{3}{5}$ in head; 10th spine, 3 in head; margin of soft dorsal nearly straight, the first soft ray, 3 in head; last ray exserted, 2 in head. Caudal well forked, the upper lobe slightly longer than lower, $2\frac{2}{5}$ length of middle rays, which are 3 in head; margin of anal similar to spinous dorsal, the last ray filamentous, $2\frac{1}{2}$ in head; anal spines rather slender, the third slightly longer than second, $3\frac{1}{4}$ in head. Ventrals, $1\frac{1}{2}$ in head. Pectorals long and pointed, reaching to first soft ray of anal, $1\frac{1}{10}$ in head.

Color in life, rosy-red with silvery luster, quite silvery below; faint pearly markings on scales of upper parts, these forming a decided stripe along base of dorsal. Head all rosy, darker above; iris silvery; mouth white within; sides with pearly spots, faint and diffuse, irregularly scattered, each about as large as a scale. Base of dorsal yellowish olive, its edge scarlet, the fin otherwise rosy. Caudal rosy, becoming scarlet behind. Pectorals, ventrals, and anal slightly rosy. In spirits the bright colors all fade, leaving irregular pearly markings on a silvery ground.

This species is rather common in the markets of Havana, where it is known as *Vorax*, by which the specific name *vorax* has been suggested.

According to Poey the *Centropristis macrophthalmus* of Müller & Troschel was based on the young of this species; if so, the latter name has the right of priority. This species agrees well with the descriptions of *Aprion filamentosus*, (C. & V.) from the islands east of Africa, but it would be premature to write two species from such widely separated localities without actual comparison of specimens.

The resemblance of the cranium of this species to that of *Etelis oculatus* has already been noticed by Poey and Gill.

VII.—Genus ETELIS.

ETELIS, Cuv. & Val., Hist. Nat. Poiss., ii, 127, 1828 (*carbunculus*).
ELASTOMA, Swainson, Nat. Hist. Fishes, etc., ii, 168, 202, 1839 (*oculatus*).
HESPERANTHIAS, Lowe, Fishes of Madeira, 1843, 14 (*oculatus*).
MACROPS, Duméril, Ichth. Analytique, 1856, 279 (*oculatus*).
ETELIS, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 447.

The synonymy and relations of this interesting genus have been well discussed by Dr. Gill in the paper above cited. In spite of the difference in the form of its dorsal, the relations of *Etelis* with *Aprion* are very close. The skulls in the two are almost identical, as has already been noticed by Poey and Gill.

26. Etelis oculatus. *Cachucho.*

Serranus oculatus, Cuv. & Val., ii, 1828, 266 (Martinique).
Elastoma oculatus, Swainson, Nat. Hist. Fishes, etc., ii, 168, 202, 1839 (generic diagnosis).
Hesperanthias oculatus, Lowe, Fishes Madeira, 1843, 14 (generic description).
Centropristis oculatus, Müll. & Trosch., in Schomb. Hist. Barbadoes, 666, 1848.
Anthias oculatus, Günther, i, 92,1859 (Jamaica; Madeira).
Etelis oculatus, Gill, Proc. Ac. Nat. Sci. Phila., 1862, 447 (Cuba); Poey, Synopsis, 292, 1868 (Cuba); Poey, Enumeratio, 31, 1875.
Macrops oculatus, Duméril, Ichth. Analytique, 1856, 279 (fide Gill).

Habitat—Martinique, Madeira, Barbadoes, Jamaica, Cuba.

Head, 3 ($4\frac{1}{5}$); depth, $3\frac{1}{2}$ (5). D. X, 11; A. III, 8. Scales, 5 (4)–53–12; 50 pores. Length of an example from Cuba, 15 inches.

Body elongate, somewhat fusiform, moderately compressed; the back moderately elevated; caudal peduncle long and very slender; profile convex on snout, thence straightish to occiput; the nape low, not keeled. Snout short, rather pointed, $3\frac{2}{3}$ in head. Eye very large, 3 in head. Preorbital very narrow, its least width 14 in head. Mouth moderate, oblique, the lower jaw projecting. Maxillary reaching middle of eye, $2\frac{1}{10}$ in head, its surface scaly. Interorbital space slightly concave, 4 in head, the supraorbital ridges prominent. Upper jaw with a narrow band of villiform teeth, outside of which is a row of moderate teeth, the two canines (sometimes duplicated) in front very sharp and projecting forward and downward, their length about 3 in diameter of pupil. Lower jaw with villiform teeth in front of jaw only, the larger teeth of the outer row smaller and more numerous than in the upper jaw; canines of lower jaw not differentiated. Tongue without teeth.

Vomer with a narrow A-shaped patch of teeth, bluntish in front and without backward prolongation on median line; no teeth on hyoid or pterygoid bones; gill-rakers long and slender, their length about $\frac{2}{3}$ diameter of eye, about 15 developed on lower part of arch. Posterior margin of preopercle almost straight and vertical, scarcely emarginate, very finely serrate; the teeth a little coarser at the angle.

Scales rather large, the rows all running parallel with the lateral line. Maxillary with about 12 scales; region behind eye well scaled; 7 rows of scales on cheek; 4 rows on interopercle, 2 on subopercle, and 8 on opercle. Temporal region with about 4 rows of large scales. Top of head and snout naked. Lower jaw with a few imbedded scales. Base of soft dorsal and anal scaleless.

Spinous and soft dorsals connected. Dorsal spines rather high and strong, the first spine short, $\frac{2}{7}$ length of second or longest spine, which is 2 in head, the spines thence becoming almost regularly and gradually shorter to last spine, which is little longer than first spine. Margin of soft dorsal straight, the rays 3 in head, the last ray slightly elongate, its length $2\frac{1}{2}$ in head. Anal similar to soft dorsal; its last ray considerably produced; its first soft rays when depressed reaching little beyond the base of the last ray; anal spines slender and regularly graduated, the third $3\frac{3}{4}$ in head. Caudal very deeply forked, the upper lobe the longer, its length 4 times length of middle rays, which are $3\frac{1}{2}$ in head. Upper lobe almost filamentous, longer than head. Ventrals, $1\frac{3}{5}$ in head. Pectorals falciform, reaching almost to anal, $1\frac{1}{5}$ in head.

Color in life, brilliant rose-red; bases of the scales deeper, sides and belly abruptly paler, rosy. Mouth reddish within; lining of gill-cavity reddish. Fins all rosy. Spinous dorsal and caudal bright red, the other fins paler. In spirits these colors fade, the fish becoming rosy white. This most beautiful species is abundant in the markets of Havana, where it is known as *Cachucho*. It is found in rather deep water, with such forms as *Lutjanus profundus*, *buccanella*, *mahogani*, *Rhomboplites aurirubens*, *Aprion macrophthalmus* and *Tropidinius dentatus*. These fishes are a little lower down in the bathymetric scale than *Lutjanus vivanus* which in turn inhabits deeper water than the other Lutjani. In still deeper water than any of these, is found *Verilus sordidus*, which is a true deep-water fish.

The *Cachucho* reaches a length of two feet or more, and is esteemed as a food-fish. The synonymy of the species offers no complications, although its generic relations have been often misunderstood. This and some other Cuban *Lutjanina* bear considerable resemblance to certain Japanese types, but it is improper to regard them as specifically identical with their Asiatic representatives until specimens have been fully compared.

VIII.—Genus VERILUS.

VERILUS, Poey, Memorias de Cuba, ii, 125, 1860 (*sordidus*).

The genus is technically close to *Etelis*, although the single known species is very different in appearance from *Etelis oculatus*. The cav-

ernous character of the skull is the most striking feature of the genus *Verilus*.

27. Verilus sordidus.

Verilus sordidus, Poey, Memorias, ii, 125, 1860, tab. 12, f. 6 (Cuba); Poey, Repertorio, ii, 157, 1867; Poey, Synopsis, 291, 1868; Poey, Enumeratio, 32, 1875.

Habitat.—About Cuba, in deep water.

Head, $2\frac{2}{5}$ ($3\frac{2}{5}$); depth, 3 ($3\frac{7}{5}$). D. IX, I, 10; A. III, 7. Scales (4), 4–43–9; 41 pores. Length of a specimen from Havana, 11 inches.

Body oblong, compressed, rather robust; caudal peduncle short and thick; head large; profile almost straight from snout to origin of spinous dorsal, and not at all steep. Snout very short and blunt, 4 in head. Eye very large, $2\frac{7}{8}$ in head. Interorbital space flat, its width $4\frac{2}{5}$ in head. Occipital keel very low. Preorbital very narrow, 7 in eye, nearly 20 in head. Maxillary reaching middle of eye, 2 in head. Mouth large, oblique, the lower jaw projecting. Upper jaw with a rather broad band of villiform teeth, the outer row scarcely enlarged; two moderate canines in front of jaw, curved inward. Lower jaw with a single series of teeth on sides of jaw, this series giving place to a very narrow villiform band in front, with two (sometimes duplicated) small canines directed nearly horizontally backward. Vomer with a narrowly $\wedge$-shaped patch of teeth, without backward prolongation on median line. Tongue and pterygoids without teeth. Gill-rakers numerous, their length almost half diameter of eye; 17 on the lower part of the arch, all developed. Preopercle with posterior margin weak and flexible, almost entire, becoming somewhat serrate at the angle and on lower limb; no distinct emargination, but the angle salient, membranaceous. Scales large, the rows horizontal below the lateral line; those above rather irregular, the series running upward and backward. Head scaly everywhere, the scales generally smaller than on body; opercle with 3 rows of scales, very large, one row on subopercle; cheeks with many rows of scales, those in the middle very small; one or two rows on interopercle. Base of soft dorsal and anal somewhat scaly. Branchiostegals 7. Spinous and soft dorsals entirely separate; first spine $4\frac{1}{5}$ in second, which is $2\frac{1}{6}$ in head, the spines thence becoming gradually shorter to ninth spine, which about equals length of first spine. Last rays of dorsal and anal not produced; margin of soft dorsal slightly concave, the anterior rays longest, $2\frac{4}{5}$ in head; anal similar to soft dorsal, its margin rather more concave; first soft rays extending beyond tips of last rays, when the fin is depressed. Anal spines moderate, the third slightly longer than second, $2\frac{3}{4}$ in head; caudal fin short, broad, moderately forked, the upper lobe longer, its length scarcely twice that of middle rays, which are $2\frac{2}{3}$ in head. Pectorals long, reaching to origin of anal, $1\frac{1}{5}$ in head; ventrals $1\frac{2}{3}$ in head.

Color in spirits dusky grey, slightly paler below; tips of spinous dorsal and ventrals jet black, the fins otherwise colored as the body;

posterior edge of caudal dusky; lining of gill-cavity, peritoneum, and posterior part of mouth jet black.

This species is rarely taken in deep water off the coast of Cuba. It is known to the fishermen as *Escolar chino*. It has never been seen elsewhere.

List of nominal species arranged in order of date, with identifications.

(Tenable specific names are printed in italics.)

Nominal species.	Year.	Identifications.
Sparus *synagris*, Linnæus	1758	Lutjanus synagris.
Labrus *griseus*, Linnæus	1758	L. griseus.
Sparus tetracanthus, Bloch	*1790	L. griseus.
Sparus *chrysurus*, Bloch	*1795	L. chrysurus.
Bodianus aya, Bloch	*1797	? L. vivanus.
Sparus vermicularis, Bl. & Sch	1801	L. synagris.
Sparus *caxis*, Bloch & Schneider	1801	L. caxis.
Anthias rabirubia, Bl. & Sch	1801	L. chrysurus.
Anthias caballerote, Bl. & Sch	1801	L. griseus.
Anthias *jocú*, Bl. & Sch	1801	L. jocú.
Bodianus ruber, Bl. & Sch	1801	? L. vivanus.
Bodianus striatus, Bl. & Sch	1801	L. caxis.
Bodianus vivanet, Lacépède	1803	L. griseus.
Sparus semiluna, Lacépède	1803	Ocyurus chrysurus.
Dipterodon plumieri, Lacépède	1803	L. synagris.
Lutjanus acutirostris, Desmaret	1823	L. caxis.
Lutjanus aubrieti, Desmaret	1823	L. synagris.
Etelis *oculatus*, Cuv. & Val	1828	Etelis oculatus.
Mesoprion *mahogani*, Cuv. & Val	1828	L. mahogani.
Mesoprion ricardi, Cuv. & Val	1828	L. mahogani.
Mesoprion uninotatus, Cuv. & Val	1828	L. synagris.
Mesoprion *analis*, Cuv. & Val	1828	L. analis.
Mesoprion sobra, Cuv. & Val	1828	L. analis.
Mesoprion *vivanus*, Cuv. & Val	1828	L. vivanus.
Mesoprion *buccanella*, Cuv. & Val	1828	L. buccanella.
Mesoprion litura, Cuv. & Val	1828	L. jocú.
Mesoprion linea, Cuv. & Val	1828	L. caxis.
Mesoprion griseus, Cuv. & Val	1828	L. griseus.
Mesoprion flavescens, Cuv. & Val	1828	L. caxis.
Mesoprion *cyanopterus*, Cuv. & Val	1828	L. cyanopterus.
Mesoprion pargus, Cuv. & Val	1828	L. cyanopterus.
Mesoprion *aurorubens*, Cuv. & Val	1829	Rhomboplites aurirubens.
Mesoprion isodon, Cuv. & Val	1833	L. analis.
Centropristis *macrophthalmus*, Müller & Troschel	1848	Aprion macrophthalmus.
Apsilus dentatus, Guichenot	1850	Tropidinius dentatus.
Lobotes emarginatus, Baird & Girard	1855	L. griseus.
Mesoprion caudanotatus, Poey	1858	L. buccanella.
Verilus *sordidus*, Poey	1860	Verilus sordidus.
Mesoprion campechanus, Poey	1860	L. vivanus.
Mesoprion *profundus*, Poey	1860	L. profundus.
Mesoprion ojanco, Poey	1860	L. mahogani.
Mesoprion vorax, Poey	1860	Aprion macrophthalmus.
Mesoprion *ambiguus*, Poey	1860	? L. ambiguus.
Mesoprion elegans, Poey	1860	Rhomboplites aurirubens.
Mesoprion armillo, Poey	1860	Tropidinius dentatus.
Lutjanus *novemfasciatus*, Gill	1862	L. novemfasciatus.
Hoplopagrus *güntheri*, Gill	1862	Hoplopagrus güntheri.
Mesoprion *aratus*, Günther	1864	L. aratus.
Mesoprion albostriatus, Peters	1865	L. caxis.
Mesoprion aurovittatus, Poey	1868	L. chrysurus.
Mesoprion pacificus, Bocourt	1868	L. novemfasciatus.
Mesoprion *argentiventris*, Peters	1869	L. argentiventris.
Genyoroge *canina*, Steindachner	1869	L. caninus.
Lutjanus *guttatus*, Steindachner	1869	L. guttatus.
Lutjanus torridus, Cope	1869	L. vivanus.
Mesoprion *inermis*, Peters	1869	L. inermis.
Lutjanus cubera, Poey	1871	L. cubera.
Mesoprion rosaceus, Poey	1870	? L. analis.
Mesoprion *lutjanoides*, Poey	1870	L. lutjanoides.
Ocyurus rijgersmæi, Cope	1871	Ocyurus chrysurus.
Lutjanus *brachypterus*, Cope	1871	L. brachypterus.
Lutjanus purpureus, Poey	1875	L. profundus.
Lutjanus blackfordi, Goode & Bean	1878	L. vivanus.
Lutjanus stearnsi, Goode & Bean	1878	L. griseus.
Lutjanus prieto, Jordan & Gilbert	1881	L. novemfasciatus.
Lutjanus *colorado*, Jordan & Gilbert	1881	L. colorado.
Aprion ariommus, Jordan & Gilbert	1883	Rhomboplites aurirubens.
Lutjanus dentatus, A. Duméril	1883?	L. cubera.

*About.

RECAPITULATION.

We have in this paper admitted 27 species of American *Hoplopagrinæ* and *Lutjaninæ*. We repeat here the list of the species, with a notice of the nature of the doubts yet remaining to be solved. The distribution of the species is indicated by the letters W. (West Indies, etc.) U. (Coasts of United States), P. (Eastern Pacific, Panama, Mazatlan, &c.).

HOPLOPAGRINÆ.

I.—Genus HOPLOPAGRUS, Gill.

1. *Hoplopagrus güntheri*, Gill. (P.)

LUTJANINÆ.

II.—Genus LUTJANUS, Bloch.

2. *Lutjanus argentiventris*, (Peters). (P.)
3. *Lutjanus caxis*, Bloch & Schneider. (W., U.)
4. *Lutjanus jocú*, Bloch & Schneider. (W., U.)
5. *Lutjanus griseus*, L. (W., U.) (Name perhaps questionable.)
6. *Lutjanus cubera*, Poey. (W.) (Name perhaps uncertain, possibly to be called *L. caninus*.)
7. *Lutjanus novemfasciatus*, Gill. (P.)
8. *Lutjanus profundus*, Poey. (W.)
9. *Lutjanus buccanella*, (Cuv. & Val.). (W.)
10. *Lutjanus brachypterus*, Cope. (W.)
11. *Lutjanus guttatus*, (Steind.). (P.)
12. *Lutjanus synagris*, (L). (W., U.)
13. *Lutjanus ambiguus*, Poey. (W.) (Perhaps a hybrid between *O. chrysurus* and *L. synagris*.)
14. *Lutjanus mahogani*, Cuv. & Val. (W.)
15. *Lutjanus vivanus*, (Cuv. & Val.). (W., U.) (Name to be adopted not quite certain; possibly two different species included in the synonomy.)
16. *Lutjanus analis*, (Cuv. & Val.). (W., U.)
17. *Lutjanus colorado*, Jor. & Gilb. (P.)
18. *Lutjanus cyanopterus*, (Cuv. & Val.). (W.) Species unknown to us; imperfectly described.
19. *Lutjanus lutjanoides*, Poey. (W.) (Species unknown to us; possibly a hybrid between *O. chrysurus* and *Lutjanus caxis*.)
20. *Lutjanus inermis*, (Peters). (P.)
21. *Lutjanus aratus*, (Günther). (P.)

III.—Genus OCYURUS, Gill.

22. *Ocyurus chrysurus*, (Bloch). (W., U.)

IV.—Genus RHOMBOPLITES, Gill.

23. *Rhomboplites aurirubens*, (Cuv. & Val.). (W., U.)

V.—Genus TROPIDINIUS, Gill.

(Possibly identical with *Apsilus* or some other earlier genus.)

24. *Tropidinius dentatus*, (Guichenot). (W.)

VI.—Genus APRION, Cuv. & Val.

(Our species possibly a distinct generic group, *Platyuius* Gill.)

25. *Aprion macrophthalmus*, (Müller & Troschel). (W.) (Possibly identical with *Aprion filamentosus* from the Isle de France.)

VII.—Genus ETELIS, Cuv. & Val.

26. *Etelis oculatus*, Cuv. & Val. (W.)

VIII.—Genus VERILUS, Poey.

27. *Verilus sordidus*, Poey. (W.)

Indiana University,
August 12, 1884.

DESCRIPTION OF FOUR NEW SPECIES OF CYPRINIDÆ IN THE UNITED STATES NATIONAL MUSEUM.

By DAVID S. JORDAN and SETH E. MEEK.

1. Cliola camura, sp. nov.

Head, 4⅓ in length to base of caudal; depth, 3½. D. 8; A. 9. Scales, 6–38–4. Teeth, 1, 4—4, 1. Length (12256, Arkansas River at Fort Lyon, Colorado), 4 inches.

Subgenus *Cyprinella*, Girard.

Body oblong, compressed, rather robust; the back considerably elevated, especially anteriorly. The anterior profile rather steep and slightly concave, there being a slight depression over anterior part of eye. Snout bluntly decurved at tip; its length 3½ in head; the height of its vertical tip nearly equal to diameter of eye. Eye small, about 4⅓ in head; mouth small, somewhat oblique, the lower jaw included, the maxillary reaching vertical from front of orbit; its length 3½ in head. Premaxillary in front on a line with lower margin of eye.

Scales large, not very closely imbricated along sides of body. Breast scaly; 16 scales in front of dorsal. Lateral line strongly decurved.

Teeth, 1, 4—4, 1, hooked, with narrow grinding surface; the edges slightly crenate.

Insertion of dorsal slightly behind that of ventrals, a little nearer tip of snout than base of caudal. Dorsal fin higher than long; its base 1¼ in head; its longest rays 1½ in head. Anal rather low and short; tips of ventrals reaching vent; length of the fin 1⅔ in head. Tips of pectorals not reaching more than ⅔ distance to origin of ventrals; the length of the fin 1½ in head.

Color, in alcohol, brownish above; sides and below silvery; tips of anterior rays of caudal dusky. A large black blotch on posterior rays of dorsal; other fins plain.

The two specimens (one 3, the other 4, inches in length) upon which

the above description is based were collected by Dr. E. Palmer, at Fort Lyon, Colorado.

This species seems to be well distinguished from all the *Cyprinellæ* described by Girard.

2. Cliola urostigma, sp. nov.

Head, 4 in length; depth, $3\frac{2}{5}$. D. 8; A. 8. Scales, 7—38—3. Teeth, 1, 4–4, 0. Length (20446, Rio San Saba), 4 inches.

Subgenus *Cyprinella*, Girard.

Body rather elongate, compressed; the back considerably elevated. Caudal peduncle rather deep; anterior profile rather steep, gently convex. Snout rather blunt, about as long as eye, which is narrower than the interorbital space, and about 4 in head. Mouth not very small, oblique, the lower jaw included. Maxillary reaching vertical from front of eye; its length $3\frac{1}{3}$ in head.

Scales rather large, closely imbricated; those on the sides of body deeper than long; about 17 scales on median line of back before dorsal. Lateral line strongly decurved.

Insertion of dorsal a little behind that of ventrals, midway between tip of snout and base of caudal. Dorsal fin higher than long, its longest rays $1\frac{2}{5}$ in head. Pectorals $1\frac{1}{3}$ in head, not nearly reaching ventrals; ventrals nearly reaching front of anal, $1\frac{1}{2}$ in head. Anal short and rather low, its free margin somewhat concave.

Color, in alcohol, silvery; darker above, with a large, distinct oblong jet-black spot at base of caudal fin; this about as large as eye. Caudal fin mesially dusky; an obsolete dusky shade on last rays of dorsal.

The above description is based upon about 20 specimens (20446) collected in part by Mr. W. W. Anderson, in San Saba River, a tributary of the (Texas) Colorado River, at Fort McKavit, Texas; and about 10 others (17812) taken in Clear Creek, Texas, by Ludwig Kumlein and R. E. Earll. These vary in length from two to four inches. Most of them are in fine condition.

This species resembles *C. calliura* and *C. stigmatura*, but it has larger scales than either of these.

3. Notropis metallicus, sp. nov.

Head, 4; depth, 5. D. 8. A 11. Scales, 5–35–3. Teeth, 2, 4–4, 2. Length (28511, Nashville, Ga.), $1\frac{3}{4}$ inches.

Subgenus *Notropis* (*Minnilus*).

Body rather elongate, somewhat compressed, formed much as in *N. chrosomus*, the back a little elevated, highest at the insertion of the dorsal. Head small, the snout not very acute, its length less than diameter of eye. Mouth rather large, oblique, the maxillary reaching to vertical from front of eye, its length $3\frac{1}{3}$ in head. Lower jaw projecting. Eye rather large, 3 in head. Interorbital region about as broad as eye.

Scales large, about 16 in front of dorsal; lateral line considerably decurved; teeth 2, 4–4, 2, the grinding surface not evident.

Insertion of dorsal fin well behind that of ventrals midway between front of orbit and base of caudal. Tip of ventrals reaching vent. Pectorals a little shorter than ventrals, their tips not reaching base of the latter. Dorsal fin about half higher than long; anal fin long and high, its free margin somewhat concave, its base 1½ in head.

Color, in alcohol, dark brown above, a pale (rosy in life ?) band about as wide as pupil running from upper part of eye straight back to middle of upper lobe of caudal fin; below this is a broader burnished dusky band, broader than eye, which extends from tip of snout along sides of body and terminates in a distinct black spot at base of caudal. Belly paler. A broad black band extending obliquely across dorsal fin; tips of anterior rays of anal fin dusky; ventrals, pectorals, and caudal pale, nearly plain.

The above description is based upon seven adult specimens collected by Mr. W. J. Taylor, in a tributary of the Altamaha (Suwannee) River, at Nashville, Ga.

All are in good condition. They vary in length from 1¼ to 1¾ inches.

This species, in its technical characters, resembles *N. rubrifrons* and other typical species of *Notropis*. It has, however, the deep coloration of the subgenus *Alburnops*, resembling in this respect, *N. chrosomus*, *N. lutipinnis* and other species with the anal fin short.

4. Notropis alabamæ, sp. nov.

Head 4¼; depth 5. D. 8; A. 10. Scales 8–53–4. Teeth 2, 4–4, 2. Length (35,297, Montgomery, Alabama), 2¾ inches.

Subgenus *Lithrurus*, Jordan.

Body more elongated than in *N. ardens* and *N. lythrurus**; the back little elevated; the anterior profile regularly and very gently curved from tip of snout to front of dorsal. Caudal peduncle long, rather slender. Head small. Mouth rather large, terminal, oblique, the lower jaw projecting. Maxillary reaching vertical from front of eye, its length 3 in head. Eye large, 2¾ in head. Interorbital space flattish, its width about equal to diameter of eye. Teeth 2, 4–4, 2 (probably with a narrow grinding surface).

Scales small, smaller and much crowded anteriorly; the exposed surfaces on the sides deeper than long; 24 scales on median line of back before dorsal. Lateral line considerably decurved.

Insertion of dorsal slightly behind that of ventrals and midway between anterior part of orbit and base of caudal. Tips of ventrals reaching vent, their length 1½ in head. Dorsal fin higher than long, its anterior rays extending beyond tips of posterior ones when the fin is deflexed. Outer rays of caudal twice as long as inner. Anal fin long, its height moderate. Length of pectorals 1⅓ in head, their tips not reaching ventrals.

**Notropis lithrurus*, Jordan, nom. sp. nov.=*Minnilus diplæmius*, Jordan & Gilbert, Synopsis Fish. N. Am., p. 197=*Hypsilepis diplæmius*, Cope, not *Semotilus diplæmius*, Rafinesque.

Color, in alcohol, dark brown above; sides with a silvery luster; belly pale; body everywhere finely punctulate with dark dots; these extend on the vertical fins, which otherwise are entirely plain. No black spot at base of dorsal nor elsewhere on the fin.

This description is drawn from six specimens, varying in length from $1\frac{1}{2}$ to $2\frac{3}{4}$ inches. They were collected in a tributary of the Alabama River, at Montgomery, Alabama, by Col. M. McDonald, of the U. S. Fish Commission.

This species is closely related to *Notropis ardens*, *punctulatus*, and others constituting the subgenus *Lythrurus*. The absence of black markings on the dorsal well distinguishes it from most of these.

U. S. NATIONAL MUSEUM, *August* 13, 1884.

DESCRIPTIONS OF FOUR NEW SPECIES OF PŒCILICHTHYS IN THE UNITED STATES NATIONAL MUSEUM.

By DAVID S. JORDAN.

1. Pœcilichthys borealis, sp. nov.

Head, $3\frac{3}{5}$ ($4\frac{3}{5}$); depth, $5\frac{3}{5}$ ($6\frac{3}{5}$). D. VIII, 9; A. II, 7. Scales, 4–53–10; lateral line with pores on 15 scales. Length (35747, Montreal, Canada), $2\frac{1}{2}$ inches.

Body moderately elongate, somewhat compressed, the caudal peduncle rather long and stout, the general form resembling that of *P. artesiæ* and *P. punctulatus*. Head rather heavy, the snout bluntish, rather strongly decurved. Anterior profile gently and somewhat evenly arched. Snout short, about half as long as eye, which is 4 in head. Mouth nearly horizontal, the lower jaw included, the maxillary extending about to opposite front of pupil, its length $3\frac{2}{3}$ in head. Teeth small. Preopercle entire. Opercular spine strong. Premaxillary not protractile. Gill membranes very slightly connected. A small black humeral scale. Cheeks, opercles, and nuchal region scaly; breast naked. Scales of moderate size. Lateral line very short, not reaching last spine of dorsal, running rather high and slightly arched. Scales of belly like those of the sides.

Dorsal fins well separated, unusually short and small; the longest spine in the largest example (♀ ?) $3\frac{1}{2}$ in head, in another one (♂ ?) $2\frac{2}{3}$ in head. Soft dorsal a little higher than spinous dorsal, also unusually small for this genus. Caudal long, truncate or slightly lunate, $1\frac{1}{4}$ in head. Anal low and short, its spines high, the first highest. Pectorals nearly as long as head, reaching past tips of ventrals.

Color in spirits: (male) dark gray (perhaps red in life) somewhat mottled with darker; sides with 11 or 12 very distinct vertical dark cross-bands (probably blue in life), each alternate one usually extending across the back, meeting its fellow of the opposite side; a dark

saddle-like blotch on back between dorsal fins; a dark bar before, behind, and below eye, radiating from eye, the suborbital bar most distinct; head with dark dots; spinous dorsal with a submedian, broad, dark band (otherwise pale); soft dorsal and caudal sharply barred with darker; about 5 dark bars across caudal; pectoral more faintly barred; lower fins pale, plain.

Another specimen, probably a female, is paler and grayer, with the cross-bars narrower and less regular; the markings on the fins are much paler, the first dorsal being without dark longitudinal band.

This species is based on five specimens, in good condition, collected at Montreal, Canada, by Mr. T. J. Doran. It may be known at once from all related species by the small numbers of rays in the fins. In life it was probably one of the most handsomely colored species of this beautiful genus.

2. **Pœcilichthys quiescens**, sp. nov.

Head, $3\frac{3}{4}$ ($4\frac{3}{5}$); depth, $6\frac{1}{4}$ ($7\frac{1}{3}$). D. XII, 11; A II, 7. Scales, 2–56–10; pores developed on 24 of them. Length (28569, Nashville, Georgia), 2 inches.

Subgenus *Boleichthys*, Girard.

Body extremely elongate, little compressed, the caudal peduncle long and rather deep, the back not elevated. Head moderately acute, the snout a little decurved, its length less than that of the eye, which is $3\frac{1}{2}$ in head. Mouth small, oblique, the maxillary reaching front of eye, its length 4 in head, lower jaw included. Teeth rather long. Preopercle entire. Opercular spine strong. Gill-membranes somewhat connected, meeting at an acute angle. No black humeral scale.

Cheeks and opercles scaly; nape and breast closely scaled. Scales rather small. Lateral line running very high, concurrent with the back, its tubes developed about to the front of soft dorsal.

Dorsal fins somewhat connected by membrane.

Spinous dorsal longer and higher than usual in this genus, the longest spines about half length of head. Soft dorsal a little higher and shorter than spinous dorsal. Caudal long, somewhat pointed, its middle rays $1\frac{1}{2}$ in head. Anal much smaller than soft dorsal, its spines rather long and slender. Pectorals shortish, $1\frac{1}{3}$ in head, not reaching to vent or to tips of ventrals.

Color in alcohol dark brown, with darker markings, as in *P. cos* and related species; a vertical row of small dark spots along base of caudal; dorsals and caudals cross-barred, forming fine checkers; a dusky blotch on front of dorsal; four dark streaks radiating from eye; cheeks and opercles with some dark points.

The type is a single, well-preserved specimen, 2 inches in length, collected in a tributary of the Altamaha River, a branch of the Suwannee, at Nashville, Ga., by Mr. W. J. Taylor.

The relations of this species are apparently with *P. cos*, from which it differs in the number of dorsal spines and in the greater union of the

gill-membranes. It is probably ornamented in life with blue and red, but no trace of these colors now remains.

3. Pœcilichthys swaini, sp. nov.

Head, $3\frac{2}{5}$ in length; depth, $4\frac{2}{5}$. D. XI, 12; A. II, 6. Scales, 3 or 4–41–7 or 8. Length (35308, Monticello, Mississippi), 2 inches.

Appearance of *Boleichthys*. Body fusiform, rather elongate, the back rather elevated anteriorly, the caudal peduncle moderate, somewhat compressed. Head rather slender and small, the anterior profile rather steep and gently curved, becoming more obtuse at the tip of the snout. Snout short, a little bluntish, its length .5 in head. Eye rather large, $3\frac{1}{2}$ in head. Mouth not very small, oblique, the lower jaw included, the maxillary reaching very nearly to opposite middle of pupil, its length $3\frac{1}{3}$ in head. Teeth rather strong, present on vomer. Preopercle entire. Gill-membranes very nearly separate. Opercular spine strong.

Opercles and cheeks well scaled. Scales of body rather large, ctenoid. Belly covered with ordinary scales. Nuchal region nearly naked. Breast naked. Lateral line wanting posteriorly on about two scales, anteriorly somewhat arched and concurrent with the back.

Dorsal fins contiguous but separate, both high, the soft dorsal shorter and higher than the spinous dorsal and much longer and higher than the anal. Longest ray of soft dorsal $1\frac{3}{4}$ in head. Caudal truncate, $1\frac{5}{6}$ in head. Pectorals moderate, $1\frac{1}{10}$ in head, not quite reaching vent. Ventrals coterminous with them, $1\frac{1}{8}$ in head.

Color in spirits, olivaceous, marbled with darker, the dark markings rather obscure and taking the form of dark quadrate spots about as large as the eye, and alternating so as to give a checkered appearance. The pale interspaces may perhaps have been of some bright color in life. Head with four dark stripes which radiate from the eye. A dark streak on anterior part of opercle. Spinous dorsal with a basal band of pale (crimson in life?); above this a dark band (probably deep blue); the outer edge of the fin broadly pale (scarlet?). Soft dorsal and caudal checkered with light and dark spots. Anal and ventrals plain, apparently bluish, the latter darkest. Pectorals plain. No black humeral spot.

A single specimen, in very good condition, except that the coloration has faded is in the National Museum, from a tributary of Pearl River at Monticello, Miss. The species is a *Pœcilichthys*, with the developed lateral line of *Nothonotus*.

4. Pœcilichthys beani, sp. nov.

Head, 4 ($4\frac{3}{4}$); depth, $5\frac{2}{5}$ ($6\frac{2}{5}$). D. VIII, 13; A. II, 7. Scales, 3–45–6. Length (35754, Lafayette County, Missouri), $1\frac{1}{5}$ inches.

Appearance of the species of *Boleichthys*, and evidently closely allied to *Pœcilichthys exilis*.

Body more elongate than in most species of *Boleichthys*, subfusiform, compressed behind, the back a little elevated; head slender, rather acute, the snout compressed, anterior profile little decurved; snout a

little shorter than eye, which is 3 in head; mouth moderate, a little oblique, the lower jaw included, the maxillary extending a little past front of eye, its length about 3⅔ in head; preopercle entire; opercular spine well developed; gill-membranes very slightly connected.

Cheeks entirely naked; opercles well scaled; nuchal region and breast naked; lateral line almost complete, anteriorly somewhat arched and concurrent with the back; no black humeral scale: belly scaled like the sides, its scales a little smaller.

Spinous dorsal rather low and short, the outline rounded; soft dorsal long, a little higher than spinous dorsal: anal small, its spines very slender; caudal but little shorter than head; pectoral about as long as head, reaching somewhat beyond tips of ventrals, nearly to vent.

Coloration in spirits precisely like that of *Pacilichthys barratti*, olivaceous, mottled and tessellated with darker olive; a dark streak forward from eye; dorsal and caudal with bands of dark spots; other fins plain.

The single typical example was sent to the Museum from Tabo Creek, a tributary of the Missouri River, near Lexington, Lafayette County, Missouri.

The lateral line in this species and the preceding is so very nearly complete that its deficiency is useless as a generic distinction. Both species are evidently allied to the species called *Boleichthys*. This shows the extremely slight value of the characters used to separate *Nothonotus* from *Boleichthys*. Doubtless all these genera with short anal fin and non-protractile premaxillary (*Pacilichthys*, *Boleichthys*, *Nothonotus*, *Nanostoma* will have to be merged in *Etheostoma*).

The character of the union of the gill-membranes is similarly subject to intergradation among closely related species.

SMITHSONIAN INSTITUTION, *August* 15, 1884.

DESCRIPTION OF *Sciæna sciera*, A NEW SPECIES OF SCIÆNA FROM MAZATLAN AND PANAMA.

By DAVID S. JORDAN and CHARLES H. GILBERT.

In several papers in the Bulletin of the United States Fish Commission and the Proceedings of the United States National Museum we have mentioned specimens of *Sciæna vermicularis* from Mazatlan and Panama. In Bulletin of the United States Fish Commission (1881, p. 315) we have given a diagnosis of this species, comparing it with our Pacific *Sciæna*. All these references belong to a species which is not the original *Corvina vermicularis* of Günther, and which until now remains unnamed.

Sciæna sciera, sp. nov.

Sciæna vermicularis, Jordan & Gilbert, Bull. U. S. Fish Comm., 1881, 315 (not *Corvina vermicularis*, Gunther).

Head, 3⅔ (4); depth, 3–3⅓ (4). D. X, I, 24; A. II, 7. Scales, 6–50

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JAN. 26, 1885.

to 55–12. Length (29499, Panama), 9 inches. Allied to *S. vermicularis*, *S. chrysoleuca*, &c.

Body oblong, the caudal peduncle slender, the back moderately elevated. Snout rather acute, projecting moderately beyond the premaxillaries, its length $3\frac{5}{6}$ in head. Anterior profile slightly concave above eye, thence from nape to dorsal steep and rather strongly convex. Mouth of moderate size, little oblique, subinferior, the maxillary extending to rather beyond the posterior margin of pupil, its length $3\frac{1}{5}$ in head. Teeth in the lower jaw in a rather broad villiform band, the outer teeth not enlarged, similar to the inner teeth. Outer teeth of upper jaw moderately enlarged. Eye medium, $5\frac{1}{2}$ in head. Interorbital space rather narrow, gently convex, its width $5\frac{1}{3}$ in head. Cranium not spongy to the touch. Preopercle rather coarsely serrate, the teeth near the angle largest, none of them directed forwards. Gill-rakers thickish, extremely short and small, the longest not longer than nostril.

Scales rather small, the soft dorsal and anal well scaled.

Dorsal spines rather slender and low, the second much stouter than the third, which is longest, 2 in head. Longest soft ray of dorsal $2\frac{3}{5}$ in head.

Caudal fin irregularly double-truncate, the median rays longest, $1\frac{3}{5}$ in head, the upper angle not produced. Longest soft rays of anal about half head. Second anal spine robust, rather long, $1\frac{5}{6}$ in head. Pectorals reaching past tips of ventrals, $1\frac{1}{5}$ in head. Ventrals $1\frac{3}{4}$.

Color steel-gray above, dull-silvery below, everywhere much soiled with dark brown points. Centers of each scale dark brown; these dark spots confluent in narrow but distinct dark stripes which follow the direction of the rows of scales; streaks above lateral line anteriorly running obliquely upwards and backwards; below lateral line horizontal and posteriorly above, and somewhat undulating. Fins plain; the edge of the spinous dorsal and the whole of the anal and ventrals blackish; other fins paler.

This species was found by Professor Gilbert rather abundant both at Mazatlan and Panama, and several specimens were obtained by him in 1881 at each of the two localities. These are numbered 28385, 29229, 29269, 29275, 29337, 29638, 29490, 29499 on the records of the United States National Museum.

This species was at first identified by us with *Corvina vermicularis*, Günther. The latter species is somewhat similar in color and in form, but it has the outer teeth of the lower jaw considerably enlarged and rather robust, and also the upper angle of the caudal produced.

Sciæna vermicularis seems to be a rare species. Besides Dr. Günther's type in the British Museum, which we have examined, the only speci-

men known to us is a single one taken by Professor Gilbert at Panama in 1883. This specimen has been destroyed by fire, and the species is not represented in the National Museum.

SMITHSONIAN INSTITUTION, *August* 15, 1884.

DESCRIPTION OF *Zygonectes zonifer*, A NEW SPECIES OF ZYGONECTES, FROM NASHVILLE, GEORGIA.

By DAVID S. JORDAN and SETH E. MEEK.

Head, $3\frac{2}{5}$; depth, $4\frac{2}{5}$. D. 7; A. 9. Scales, 36–11. Length (28505, Nashville, Ga.), $2\frac{3}{4}$ inches.

Body moderately elongate, compressed, the head comparatively broad and depressed, the anterior profile somewhat concave above the eyes, thence a little convex to the dorsal. Head anteriorly rather pointed in profile, the snout nearly as long as eye, which is about half the broad interorbital space and $3\frac{1}{3}$ in head. Teeth quite small, the outer little enlarged. Scales rather small.

Dorsal fin much smaller than anal, and inserted nearly over the end of the first third of that fin. Anal higher than dorsal, as well as longer, both fins highest in the male, in which they reach very nearly to base of caudal. Insertion of dorsal midway between front of eye and tip of caudal. Caudal rounded, about as long as head. Least depth of caudal peduncle half length of head. Pectorals $1\frac{1}{2}$ in head, reaching slightly past front of ventrals. Ventrals nearly reaching anal, $1\frac{2}{3}$ in head.

Color of specimen with highest fins (supposed to be male) dark olive above, with the edges of the scales a little darker; sides somewhat silvery, with 12 sharply defined black cross-bars, not half as wide as the interspaces, nearly vertical, those near the middle of the body a little farther apart and a little more distinct than the others. No longitudinal streaks. Fins without ocelli. Caudal entirely plain. Dorsal and anal with distinct cross-streaks of dark dots.

Other specimens (perhaps females) with the color a little darker; the black cross-bands broader and more sharply defined; a conspicuous black blotch below the eye; fins colored as in the others.

This species is founded on three specimens, all about equal in size, in fine condition, taken by Mr. W. J. Taylor in a tributary of the Altamaha (Upper Suwannee River), near Nashville, Ga., and by him sent to the U. S. National Museum, with *Pœcilichthys quiescens*, *Notropis metallicus*, *Elassoma evergladei*, and other interesting species. The specimen of the latter species, larger than the original types, shows an approach in coloration to *E. zonatum*, showing faint vertical bars and a dusky scapular spot. Its depth is $4\frac{1}{3}$ in length of body, the form being considerably more elongate and less compressed than in *E. zonatum*. The scales are about 32–15.

SMITHSONIAN INSTITUTION, *August* 15, 1884.

ANNOTATED LIST OF THE DESCRIBED SPECIES OF PARASITIC COPEPODA (SIPHONOSTOMA) FROM AMERICAN WATERS CONTAINED IN THE UNITED STATES NATIONAL MUSEUM.

By RICHARD RATHBUN.

The collection of marine invertebrates in the U. S. National Museum contains a large number of species of parasitic Copepoda, which have been mostly obtained from the New England coast during recent years by the U. S. Fish Commission. Of these the writer has identified twenty-six species (two doubtfully) with species already described by European and American writers, as recorded in the present list. Seventeen are identical with European forms, and it is probable that further studies will increase the number of species common to both sides of the Atlantic. In many of these determinations he has had the opportunity of making direct comparisons with European specimens received in exchange from the Rev. A. M. Norman and Prof. G. S. Brady, of England.

Two species of *Argulus* (*A. laticauda* and *A. megalops*) described by Prof. S. I. Smith, in 1873, from specimens taken at the surface and among algæ, have been located on several species of fish, and two Atlantic species (*Lepeophtheirus salmonis* and *Anchorella uncinata*) have been traced to the Alaskan region. Three of the species recorded in the list (*Argulus alosæ* (?), *Anthosoma crassum*, and *Cecrops Latreillii*) were mentioned by Gould in his "Report on the Invertebrata of Massachusetts," 1841; and ten species of the same (*Caligus curtus*, *Caligus rapax*, *Echthrogaleus coleoptratus*, *Pandarus Cranchii* (?), *Nogagus Latreillii*, *Cecrops Latreillii*, *Anthosoma crassum*, *Lernæa branchialis*, *Anchorella uncinata*, and *Lernæonema radiata*) are given by Professor Smith, from personal observation, in the "Report of the U. S. Commissioner of Fish and Fisheries," Part I, for 1871 (1873). In the same report Professor Smith describes four new species, which are also here included—*Argulus laticauda*, *Argulus latus*, *Argulus megalops*, and *Echthrogaleus denticulatus*. The following additional species recorded by him, mostly on the authority of others, are not contained in the museum collection, and have not been observed by the writer: *Ergasilus labracis* (Kröyer), *Argulus catostomi* (Dana and Herrick), *Nogagus tenax* (Steenstrup and Lütken), and *Pandarus sinuatus* (Say). The *Pennellæ*, of which there are many specimens in the museum collection, have not yet been studied.

The numbers which precede the localities in the list and those included in parentheses in the notes refer to the Crustacean catalogue of the U. S. National Museum. The number of specimens in each lot is also stated, being given at the end of each entry. The bibliographical references have been mainly restricted to the authority for the species and to the American publications treating of the same. The classifica-

tion followed is that proposed by Dr. C. Heller in his report on the Crustacea of the Novara exploring expedition. Mr. V. N. Edwards, whose name frequently appears in the following list, is a collector in the service of the U. S. Fish Commission at Wood's Holl, Mass., and has contributed much material in this group of animals.

ARGULINA.

Argulus laticauda, Smith.

Report U. S. Commissioner of Fish and Fisheries, part i, p. 574 (280), 1873.

From the Eel, *Anguilla rostrata*, (Le S.) De Kay:

6177. Noank, Conn., U. S. Fish Commission, 1874; 14 specimens.

6013. Wood's Holl, Mass., V. N. Edwards, October 27, 1881; 34 specimens.

6014, 6015, 6016. Wood's Holl, Mass., V. N. Edwards, October 27, 1881; 3 specimens. (Microscopic preparations.)

8278, 8279. Wood's Holl, Mass., V. N. Edwards, October 19, 23, 1883; 12 + 6 specimens.

From the New England Flat Fish, *Pleuronectes americanus*, Walb.:

6152. Waquoit Harbor, Falmouth, Mass., U. S. Fish Commission, September 10, 1883; 3 specimens.

6171. Waquoit Harbor, Falmouth, Mass., U. S. Fish Commission, September 26, 1883; 1 specimen.

Host unknown:

6054. Buzzard's Bay, Massachusetts, U. S. Fish Commission, August 14, 1883; 1 specimen.

From among *algæ*:

6182. Vineyard Sound, Massachusetts, U. S. Fish Commission, August, 1871; 2 specimens. (Types of S. I. Smith.)

This species has so far proved to be the most abundant one of the genus on the southern coast of New England, although the *Argulus megalops* is more widely distributed as regards the different species of fish on which it has been found. Its common host is the eel. Mr. V. N. Edwards, of Wood's Holl, who has often observed it, states that specimens of this fish are frequently infested by it to an extraordinary extent, and he estimates that as many as a hundred parasites are occasionally found on a single individual. The original specimens described by Professor Smith were found among algæ from the shore and at the surface. The largest of his specimens is somewhat below the average size of those obtained from eels, but otherwise they are characteristic. This species is readily distinguished from the other described New England species by its black markings, which generally cover the greater part of the body.

Argulus latus, Smith.

Op. cit., part i, p. 574 (280), 1873.

From the surface:

6181. Vineyard Sound, Massachusetts, U. S. Fish Commission, July 1, 1871; 1 specimen. (Type of S. I. Smith.)

This species is known only from the type specimen of Professor Smith.

Argulus megalops, Smith.

Op. cit., part i, p. 575 (281), 1873.

From the common Skate, *Raia erinacea*, Mitch.:

6068. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 28, 1883; 5 specimens.

From the Sculpin, *Cottus octodecimspinosus*, Mitch.:

8281. Wood's Holl, Mass., V. N. Edwards, November 20, 1883; 2 specimens.

From the Web-fingered Sea robin, *Prionotus palmipes*, Storer:

8275, 8639. Wood's Holl, Massachusetts, U. S. Fish Commission, August, 1884; 5 + 2 specimens.

From the common Flounder, *Paralichthys dentatus*, (L.) Jordan & Gilbert:

6067. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 28, 1883; 1 specimen.

8638. Wood's Holl, Mass., U. S. Fish Commission, September 8, 1884; 3 specimens. (Also from *Pleuronectes americanus*.)

From the Spotted Sand Flounder, *Bothus maculatus*, (Mitch.) Jor. & Gilb.:

6069. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 28, 1883; 1 specimen.

From the New England Flat Fish, *Pleuronectes americanus*, Walb.:

8276. Wood's Holl, Mass., V. N. Edwards, October 31, 1883; 2 specimens.

From the Tomcod, *Microgadus tomcod*, (Walb.) Gill.:

8280. Wood's Holl, Mass., V. N. Edwards, November 16, 1883; 1 specimen.

From the surface.

6179. Vineyard Sound, Massachusetts, U. S. Fish Commission, July 8, 1871; 3 specimens. (Types of S. I. Smith.)

From the above list it will be observed that this species occurs on many kinds of fish on the Southern New England coast. The colors vary from a nearly pure white to a yellowish white and light brownish yellow. Nearly all the specimens recently collected are considerably larger than the types of Professor Smith. The largest are (6068) from *Raia erinacea* and (8276) from *Pleuronectes americanus*. The extreme length of the largest specimen is over 5 millimeters, and the extreme breadth about 3 millimeters.

† **Argulus alosæ**, Gould.

Rept. Invert. of Mass., p. 340, fig., 1841; Smith, *op. cit.*, part i, p. 575 (281), 1873.

Host unknown.

4410. Great Egg Harbor, New Jersey, William Stimpson; 1 ♀ specimen.

The single specimen above recorded was collected by the late Dr. William Stimpson, probably about twenty years ago, but the species of fish from which it was taken is not stated on the label: it may possibly

have been captured at the surface. It agrees quite closely with the crude figure and brief description of Gould, and the species of fish (the Alewife, *Clupea vernalis* or *æstivalis* Mitch.) from which his specimen was obtained occurs on the New Jersey coast. The writer has never seen specimens collected from the Alewife.

Mr. J. F. Whiteaves records this species doubtfully from the Gulf of Saint Lawrence, in the following terms: "An *Argulus*, closely allied to *A. alosæ* of Gould, if not identical with it, was taken off Pictou Island, in towing nets, attached to *Gasterosteus biaculeatus?* and other small fishes."* Prof. S. I. Smith, who has examined one of Mr. Whiteaves' specimens, regards it as probably *Argulus alosæ*.

CALIGINA.

Caligus curtus Müller.

Entomostraca, p. 130, pl. 21, 1785; Smith, *op. cit.*, part i, p. 575 (281), 1873. *Caligus americanus* Pickering and Dana, Am. Jour. Sci., vol. xxxiv, p. 225, pl. 3–5, 1838; Dana, U. S. Expl. Expd., Crust, pl. 93.

From the Cod, *Gadus morrhua*, Linn:

8024. Casco Bay, Me., L. A. Lee, June 15, 1883; 6 ♂ ♀ specimens.
8023. Harpswell, Me., L. A. Lee, November 2, 1883; 1 ♀ specimen.
8022. Harpswell, Me., L. A. Lee, November 9, 1883; 1 ♀ specimen.
8025. Cox Ledge, latitude 41° 11′ 30″ N., longitude 71° 02′ W., U. S. Fish Commission str. Albatross, July 25, 1884; 25 + ♂ ♀ specimens.

From the Hake, *Phycis tenuis*, (Mitch.) Dek.:

8026. Off Martha's Vineyard, Mass., U. S. Fish Commission, October 4, 1882; 5 ♀ specimens.

From the Barn Door Skate, *Raia lævis*, Mitch.:

6162. Near Station 2091, latitude 40° 01′ 50″ N., longitude 70° 59′ W., 117 fath., U. S. Fish Commission, September 21, 1883; 1 ♀ specimen.

Compared with specimens (8027) from the Cod, Durham coast, England, received from the Rev. A. M. Norman.

The specimens recorded above from *Raia lævis* may possibly have been living upon Cod taken at the same time, as it frequently happens that when large numbers of fish are taken together by means of trawls the active parasitic forms become attached to other species than those on which they commonly live. The collection of Prof. L. A. Lee, made from the Cod in Casco Bay, Maine, from which three of the above lots were selected, contained numerous specimens collected both in the spring and fall, indicating that the species is abundant in that region. It is also commonly met with in the region about Cox Ledge, off the coast of southern New England, and would probably be found wherever Cod occur on our coast.

* On recent deep-sea dredging operations in the Gulf of Saint Lawrence; Am. Jour. Sci., vii, March, 1874 (p. 8, reprint).

? **Caligus productus**, Dana.

U. S. Expl. Expd., Crust., vol. ii, p. 1354, pl. 94, fig. 4.

From the Dolphin, *Coryphæna*, sp.:

6109. Latitude 38° 19′ 26″ N., longitude 68° 20′ 20″ W., surface, U. S. Fish Commission steamer Albatross, 1883; 8 ♂ ♀ specimens. (Inside of gill-covers and surface of body).

Our specimens agree tolerably well with the figures given by Kröyer,* who also had it from the Dolphin; but there are some points of difference which render the identification doubtful until comparison can be made with authentic specimens.

Caligus rapax, Edwards.

Hist. Nat. des Crustacés, tome iii, p. 453, pl. 38, fig. 9–12, 1840; Smith, *op. cit.*, part i, p. 575 (281), 1873.

From the Sting Ray, *Trygon centrura*, (Mitch.) Gill:

6188. Vineyard Sound, Massachusetts, U. S. Fish Commission, 1871; 6 ♀ specimens.

From the surface:

6197. Vineyard Sound, Massachusetts, U. S. Fish Commission, September 3, 1871; 2 ♂ ♀ specimens.

The specimens here recorded are the ones originally referred to this species by Prof. S. I. Smith (*loc. cit.*). Numerous specimens of apparently the same species have since been obtained from many other sources, but as I have not been able to identify them satisfactorily, I prefer to omit them from the present list. They may possibly represent a new species.

Lepeophtheirus Nordmannii, (M. Edwards) Baird.

Nat. Hist. of the British Entomostraca, p. 275, pl. xxxiii, fig. 1, 1850.

From the Sunfish, *Mola rotunda*, Cuv.:

6018. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 19, 1882; 30 + ♀ specimens.

Lepeophtheirus salmonis, Kröyer.

Naturhistorisk Tidsskrift, III, vol. ii, p. 211, pl. 17, fig. 1, 1863; Smith, *op. cit.*, part i, p. 576 (282), 1873; part ii, p. 662, 1874.

From Salmon? (*Salmo*, sp.):

8489. Ungava Bay, Labrador, L. M. Turner, observer, U. S. Signal Service; 15 + ♀ specimens.

From the Gorbuscha Salmon, *Oncorhynchus gorbuscha*, (Walb.) Gill & Jor.:

6107. Port Chatham, Cook's Inlet, Alaska; 2 ♀ specimens.

Compared with English specimens (8030) from the Salmon, received from the Rev. A. M. Norman, with which the American specimens agree closely. There are also in the National Museum collection several spec-

* Naturhistorisk Tidsskrift, ser. 3, vol. ii, p. 138, pl. 3, fig. 4, 1863–'64.

imens (8117) of a *Lepeophtheirus*, taken from the King Salmon (*Oncorhynchus chouicha*), in Kenai, Alaska, by Mr. W. J. Fisher, July, 1880, which differ but slightly from this species, and may possibly be only a variety of it. The principal differences noticed were as to the second pair of foot-jaws: which are proportionally shorter, and are armed with an elongate crest on the front edge near the middle.

The specimens from Mr. Turner, Ungava Bay, Labrador, are not labeled as to the fish from which they were obtained, and as that observer is still absent from this country, it is impossible to more than surmise their origin. His notes will undoubtedly furnish the desired information on his return.

Echthrogaleus coleoptratus, (Guérin) Steenstrup & Lütken.

Det Kongelige Danske Videnskabernes Selskabs Skrifter, Femte Raekke, Naturvidenskabelig og Mathematisk Afdeling, Femte Bind, Kjöbenhavn, p. 380, pl. 8, fig. 15, 1861; Smith, *op. cit.*, part i, p. 576 (282), 1873.

From dorsal fin of the Mackerel Shark, *Lamna cornubica*, (Gmel.) Fleming:

6185. Vineyard Sound, Massachusetts, U. S. Fish Commission, September 19, 1871; 2 ♀ specimens.

Compared with specimens (8179) from Cornwall, England, received from the Rev. A. M. Norman.

Echthrogaleus denticulatus, Smith.

Op. cit., part i, p. 576 (282), 1873.

From Atwood's Shark, *Carcharodon Atwoodi*, (Storer):

6196. Vineyard Sound, Massachusetts. U. S. Fish Commission, 1871; 1 ♀ specimen. (Type of S. I. Smith.)

Professor Smith's type specimen is the only one known.

Pandarus Cranchii, Leach.

Dict. des Sci. Nat., tome xiv, p. 535, 1819; Smith, *op. cit.*, part i, p. 576 (282), 1873.

From the Dusky Shark, *Carcharinus obscurus*, (Lesueur) Jor. & Gilb.:

6019, 6020. Station 1142, latitude 39° 32′ N., longitude 72° W., surface, U. S. Fish Commission, September 8, 1882; 1 + 3 ♀ specimens.

From large Shark, species undetermined:

8641. Station 2237, latitude 39° 12′ 17″ N., longitude 72° 09′ 30″ W., surface, U. S. Fish Commission, steamer Albatross, September 13, 1884; 3 ♀ specimens.

Compared with specimens (6831) furnished by Prof. G. S. Brady, of England, collected by H. M. S. Challenger from *Carcharias brachyurus*, between Papua and Japan. Slight differences were noticed in some of the appendages, though none were apparently of specific value.

Nogagus curticaudis, (Dana) Brady.

Report on the scientific results of the voyage of H. M. S. Challenger, vol. viii, part xxiii, report on the Copepoda, p. 135, 1883.

From the Dusky Shark, *Carcharinus obscurus*, (Lesueur) Jor. & Gilb.:

6033. Station 1142, latitude 39° 32′ N., longitude 72° W., surface, U. S. Fish Commission, September 8, 1882; 9 ♂ specimens.

The above specimens were identified by comparison with a specimen of *Nogagus curticaudis* (6917), kindly furnished by Prof. G. S. Brady, of England, and obtained by H. M. S. Challenger, on *Carcharias brachyurus*, between Papua and Japan. I can distinguish only slight differences between them, which could not be regarded as of specific value. Our specimens were associated with *Nogagus Latreillii* and *Pandarus Cranchii* on the same fish.

Nogagus Latreillii, Leach.

Dict. des Sci. Nat., tome xiv, p. 536, 1819, (teste Edwards *et al.*)

From the Dusky Shark, *Carcharinus obscurus*, (Lesueur) Jor. & Gilb.:

6031. Station 1142, latitude 39° 32′ N., longitude 72° W., surface, U. S. Fish Commission, September 8, 1882; 1 ♂ specimen.

From large Shark, species not determined:

8640. Station 2237, latitude 39° 12′ 17″ N., longitude 72° 09′ 30″ W., surface, U. S. Fish Commission, steamer Albatross, September 13, 1884; 6 ♂ specimens. (Associated with *Pandarus Cranchii*, No. 8641.)

In addition to the above, there are in the National Museum collection many other specimens of a *Nogagus*, of smaller size, obtained from several species of sharks, which belong to a closely related, if not the same, species. I have omitted them from the list until they can be compared with European specimens. One lot of these, from Atwood's shark (*Carcharodon Atwoodi*) were recorded by Prof. S. I. Smith, in the Report of the U. S. Fish Commissioner, Part I, p. 576, as *Nogagus Latreillii*, and in the same connection that author mentions the principal differences from the published figures and descriptions, which I have also observed.

Cecrops Latreillii, Leach.

Encyl. Brit., Suppl., vol. i, p. 405, pl. 20, 1816, (teste M. Edwards *et al.*); Gould, Rept. Invert. Mass., p. 341, 1841; Smith, *op. cit.*, part i, p. 577 (283), 1873.

From the Sunfish, *Mola rotunda*, Cuv.:

6017. Off Gay Head, Massachusetts, U. S. Fish Commission, July 12, 1881; 2 ♂ ♀ specimens. (Gill laminæ.)

Læmargus muricatus, Kröyer.

Naturhistorisk Tidsskrift, bind i, p. 487, pl. 5, fig. A, B, C, D., 1837.

Host unknown.

3693. Jeffrey's Bank, Gulf of Maine, fishing schooner Paul Revere; 2 ♀ specimens. (Gloucester Donation No. 926.)

DICHELESTINA.

Dichelestium sturionis, Hermann.

Mém. aptérologique, p. 125, pl. 5, figs. 7, 8, 1804, (teste M. Edwards); M. Edwards, Hist. Nat. des Crust., vol. iii, p. 485, pl. 39, fig. 4, 1840; Van Beneden, Annales des Sciences Naturelles, III, Zool., tome 16, p. 95, 1851.

From the Sturgeon, *Acipenser oxyrhynchus*, Mitch.:

6189. Vineyard Sound, Massachusetts, U. S. Fish Commission, 1875; 1 ♂ specimen.

8184. Vineyard Sound, Massachusetts, U. S. Fish Commission, 1884; 1 ♀ specimen. (Inside of gill-covers.)

6173. Fisher's Island Sound, Connecticut, U. S. Fish Commission, July 20, 1874; 20 + ♂ ♀ specimens. (Gill cavity.)

6175. Long Island Sound, off Noank, Connecticut, U. S. Fish Commission, July 22, 1874; 2 ♂ ♀ specimens. (Gill cavity.)

6174. Long Island Sound, off Noank, Connecticut, U. S. Fish Commission, August 20, 1874; 8 + ♂ ♀ specimens. (Long-nosed Sturgeon.)

Compared with specimens (8185) from the Sturgeon, Cornwall, England, received from the Rev. A. M. Norman.

Anthosoma crassum, (Abildgaard) Steenstrup & Lütken.

Op. cit., p. 397, pl. 12, fig. 24, 1861; Smith, *op. cit.*, part i, p. 577 (283), 1873. *Anthosoma Smithii*, Leach; Gould, Rept. Invert. of Mass., p. 341, 1841.

From the Sand Shark, *Odontaspis littoralis*, (Mitch.) Jor & Gilb.:

6039. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 7, 1883; 1 ♂ specimen. (Fin.)

From the Spiny Dog-fish, *Squalus acanthias*, Linn.:

8034. About 125 miles south of Martha's Vineyard, Massachusetts, U. S. Fish Commission, steamer Albatross, August 5, 1884; 1 ♂ specimen.

Compared with a specimen (8108) from England, obtained from *Lamna cornubica* by Dr. Francis Day.

CHONDRACANTHINA.

Anteacheres Dübenii, M. Sars.

Nyt Magazin for Naturvidenskaberne, p. 128, pl. 9, fig. 24–34, pl. 10, fig. 35–53, 1870.

From the deep-water Actinian, *Bolocera Tuediæ*, Gosse:

6009. Station 879, latitude 39° 49′ 30″ N., longitude 70° 54′ W., 225 fathoms, September 13, 1880, U. S. Fish Commission; 26 ♂ specimens.

6010. Same station; 8 ♂ ♀ specimens.

6011, 6012. Same station; 11+15 ♀ specimens.

6004. Station 1112, latitude 39° 56′ N., longitude 70° 35′ W., 245 fathoms, August 22, 1882, U. S. Fish Commission; 8 ♂ ♀ specimens.

6003. Station 1153, latitude 39° 54′ N., longitude 70° 37′ W., 225 fathoms, October 4, 1882, U. S. Fish Commission; 28 ♂ specimens.

6005. Same station; 2 ♂ ♀ specimens.

6006, 6007, 6008. Same station; 6+3+11 ♀ specimens.

This species is generally abundant wherever *Bolocera Tuediæ* occurs; it lives in the stomach and body cavity. Several specimens are often obtained from a single Actinian.

LERNÆOPODINA.

Lernæopoda (?) coregoni, Smith.

Op. cit., part ii, p. 664, pl. iii, fig. 17, 1874.

From the Whitefish, *Coregonus clupeiformis*, (Mitch.) Milner:

6072. Grand Island, Lake Superior, J. W. Milner; 1 ♀ specimen.

Brachiella rostrata, Kröyer.

Naturhistorisk Tidsskrift, bind i, p. 207, pl. 2, fig. 1, 1837.

From the Halibut, *Hippoglossus vulgaris*, Fleming:

6212. Fishing grounds of Eastern North America, Gloucester fishing vessel, 1883; 4 ♀ specimens. (The exact locality not known.)

Compared with specimens (8343) from the halibut, Shetland, received from the Rev. A. M. Norman.

Anchorella uncinata, (Müller) Nordmann.

Mikrographische Beiträge, Zweites Heft, p. 102, pl. 8, fig. 8–12, pl. 10, fig. 1-5, 1832; Smith, *op. cit.*, part i, p. 578 (284,) 1873.

From the Cod, *Gadus morrhua*, Linn.:

7997. Casco Bay, Maine, L. A. Lee, 1883; 3 ♀ specimens. (Fins and gills.)

7996. Harpswell, Me., L. A. Lee, October 6, 1883; 5 ♀ specimens. (Gills and fins.)

7994. Harpswell, Me., L. A. Lee, October 27, 1883; 1 ♀ specimen. (Fins.)

7993. Harpswell, Me., L. A. Lee, November 2, 1883; 2 ♀ specimens.

7995. Harpswell, Me., L. A. Lee, November, 1883; 2 ♀ specimens. (Fins and gills.)

6140. Off the southern coast of New England, U. S. Fish Commission, 1883; 1 ♀ specimen. (Side of month.)

7990. Cox Ledge (latitude 41° 11′ 30″ N., longitude 71° 02′ W.), U. S. Fish Commission, steamer Albatross, July, 1884; 30+♀ specimens. (Gills and inside of gill-covers.)

8347. Cox Ledge, U. S. Fish Commission, steamer Albatross, August 1, 1884; 10 + ♀ specimens. (Gills and fins.)

7991. Bering Island, Siberia, L. Stejneger (2422), 1882–'83; 1 ♀ specimen.

7992. Bering Island, Siberia, L. Stejneger (2423), 1882–'83; 6 ♀ specimens.

From the Haddock, *Melanogrammus æglefinus*, (Linn.) Gill:

6118. George's Bank, U. S. Fish Commission, steamer Albatross, August 22, 1883; 4 ♀ specimens. (Gills.)

Compared with specimens (7998) from Cornwall, England, received from the Rev. A. M. Norman. The specimens obtained at Bering Island, Siberia, by Mr. Stejneger, do not differ in any essential particulars from those taken on our eastern coast; but several of his specimens are much above the average size. The remarks made with regard to the distribution of *Caligus curtus* will apply equally well to this species.

LERNÆINA.

Lernæonema radiata, (Lesueur) Steenstrup & Lütken.

Op. cit., p. 400, 1861; Smith, *op. cit.*, part i, p. 578 (284), pl. 7, fig. 30, 1873. *Lernæocera radiata*, Lesueur, Jour. Acad. Nat. Sci., Phila., vol. iii, p. 288, pl. 11, fig. 1, 1824.

From the Menhaden, *Brevoortia tyrannus*, (Latrobe) Goode:

6176. Vineyard Sound, Massachusetts, U. S. Fish Commission, 1875; 1 ♀ specimen.

6002. Vineyard Sound, Massachusetts, V. N. Edwards, May 22, 1883; 8 ♀ specimens.

6001. Vineyard Sound, Massachusetts, V. N. Edwards, July 4, 1883; 1 ♀ specimen.

6057. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 21, 1883; 1 ♀ specimen.

6061, 6062, 6063. Vineyard Sound, Massachusetts, U. S. Fish Commission, August 23, 1883; 1 + 1 + 3 ♀ specimens.

8282. Vineyard Sound, Massachusetts, U. S. Fish Commission, 1883; 4 ♀ specimens.

6000. Great Egg Harbor, New Jersey, William Stimpson; 10 ♀ specimens. (Old collection; host not recorded, but probably from Menhaden).

Prof. S. I. Smith (*loc. cit.*) records this species from Menhaden taken at Great Egg Harbor, New Jersey, and Stimpson's specimens above mentioned were undoubtedly obtained from the same fish, although their origin is not stated on the label attached to them. It can scarcely be regarded as an abundant species, at least not at all seasons, and the specimens entered in the above list as from Vineyard Sound were only obtained after an examination of many hundred fish.

Lernæa branchialis, Linn.

Systema Naturæ; Steenstrup & Lütken, *op. cit.*, p. 403, pl. 13, fig. 28, (var. *sigmoidea*, p. 404, pl. 13, Fig. 29), 1861; Smith, *op. cit.*, part i, p. 578 (284), 1873.

From the gills of the Cod, *Gadus morrhua*, Linn.:

6145. George's Bank, Captain Gourville, schooner Rebecca Bartlett, March, 1880; 2 ♀ specimens. (Gloucester donation 643.)

8488. Harpswell, Me., L. A. Lee, October 6, 1883; 1 ♀ specimen.

6211. Disco Bay, Greenland, Ensign H. G. Dresel, U. S. N., U. S. S. Yantic, 1883; 2 ♀ specimens.

The majority of the specimens in the collection approach more nearly the var. *sigmoidea*, Steenstrup & Lütken, than the typical form as commonly figured.

Lernæolophus sultanus, (Nordmann) Heller.

Reise der Œsterreichischen Fregatte Novara um die Erde, in den Jahren 1857, 1858, 1859; Crustaceen, p. 251, pl. 25, fig. 7, 1868.

From the orange File-fish, *Alutera Schœpfii*, (Walb.) Goode:

6186. Vineyard Sound, Massachusetts, U. S. Fish Commission, 1874; 4 ♀ specimens.

Agrees quite closely with the figure given by Heller, except that the appendages about the mouth are not so distinctly uncinate.

Hæmobaphes cyclopterina, (Fabr.) Steenstrup & Lütken.

Op. cit., p. 405, pl. 13, fig. 30, 1861.

From *Lycodes Verrillii*, Goode & Bean:

6137. South of Seal Island, Nova Scotia, U. S. Fish Commission, 1877; 1 ♀ specimen.

The single specimen in the collection is not in a sufficiently perfect condition to permit of a careful examination of the mouth parts, but in all other details it agrees quite well with the figures of Steenstrup and Lütken.

ON SOME NEW OR LITTLE KNOWN DECAPOD CRUSTACEA, FROM RECENT FISH COMMISSION DREDGINGS OFF THE EAST COAST OF THE UNITED STATES.

By SIDNEY I. SMITH.

Anamathia* Agassizii.

Amathia Agassizii Smith, Bull. Mus. Comp. Zool., x, p. 1, pl. 2, figs. 2, 3, 1882; Proc. Nat. Mus., vi, p. 3, 1883; Report U. S. Fish Com., x, for 1882, p. 346, 1884.

This species will probably prove to be synonymous with *A. crassa* A. Milne-Edwards, the description of which I had not seen when my species was published.

A male taken this season is almost as large as the large female taken last year. Soon after preservation in alcohol the red color upon the peræopods was very bright, and there was considerable red on the carapax also.

The name *Amathia* given to this genus by Roux in 1828 had been used in 1812 by Lamouroux for a genus of Bryozoa. Roux's genus includes the following species:

Anamathia Rissoana (Roux). Mediterranean.
Anamathia hystrix (Stimp.). Straits of Florida.
Anamathia Tanneri (Smith). Off Delaware Bay and Martha's Vineyard.
Anamathia crassa (A. M.-Edw.). Straits of Florida.
Anamathia Agassizii (Smith). Off Carolinas and Martha's Vineyard.
Anamathia modesta (Stimp.). Straits of Florida.

Munidopsis Whiteaves.

A careful examination of the structural characters of the type species of this genus with A. Milne-Edwards's *Galacantha rostrata*, my *G. Bairdii*, and the two species here described, induces me to refer them all to a single genus. The oral appendages are almost exactly alike in all the species, except unessential differences in the armament of the second gnathopods. The number and arrangement of the branchiæ are the same in all and like that in the typical species of *Munida*, though the number of epipods varies. In *Munidopsis curvirostra* and *Bairdii* there are only two epipods on each side as in the typical species of *Munida*, one at the base of the maxilliped and the other at the base of the second gnathopod; in *Munidopsis crassa* and *similis* there is an additional pair at the base of the first peræopod; while in *Munidopsis rostrata* there are additional ones at the bases of each of the first three pairs of peræopods. The eyes in *Munidopsis Bairdii*, *crassa*, and *similis* are much alike and considerably different from those of the other species,

* Nom. nov., vice *Amathia* Roux, præoc.

but it does not seem desirable to consider such differences, or those in the number of epipods, as of generic value.

Munidopsis crassa, sp. nov.

This species, which is represented by a single specimen, resembles *M. Bairdii* in having spine-tipped eye-stalks and the dorsum of the pleon without median teeth or spines, but is at once distinguished from it by the broad and stout non-spined rostrum, the spiny propodi of the ambulatory peræopods, and the very different armament of the carapax.

Female.—The carapax is very broad and the lateral margins nearly parallel. The front is gradually narrowed from between the bases of the peduncles of the antennæ into a very broad, stout, triangular, and nearly horizontal rostrum about half as long as the greatest breadth of the carapax, and over the bases of the ocular spines fully half as broad as long. The rostrum is flat or very slightly concave, and nearly smooth beneath, but the dorsal side has a strong median carina and is roughened with small tubercles; the sharp lateral edges are armed with a few minute teeth. There is a prominent acutely triangular spine on the anterior margin over the base of the antenna each side, and outside of this a conical spine directed forward from the angle of the small hepatic region, which really forms the antero-lateral angle of the carapax, though the anterior lobe of the branchial region expands laterally much beyond the hepatic region, and is armed at its anterior angle with a great dentiform spine, back of which there are several smaller spines on the lateral margin of this lobe and a single small one at the anterior angle of the posterior branchial lobe. The gastric region is prominent, and armed in front with a pair of sharp conical spines, and back and outside of these with many smaller spines and tubercles, as are also the anterior branchial lobes, and the extreme anterior portions of the branchial and cardiac regions. The cervical suture and the suture between the anterior and posterior lobes of the branchial region are marked by smooth grooves, of which the gastro-cardiac portion of the cervical is the most conspicuous. The whole posterior part of the cardiac and branchial regions is armed with sharply crenulated, transverse, and broken rugæ with smooth spaces between, and a broader smooth space along the posterior margin, which is armed with a high double crest the edges of which are sharply crenulated.

The eye-stalks are short, broad, and somewhat cuboidal in form, are capable of very little motion, bear the rather small hemispherical white eye partially imbedded at the end, which projects on the dorso-mesial side in a slender spine longer than the diameter of the cornea, and are armed with a much smaller spine on the outer edge just back of the eye, and with a very small spine or tubercle similarly situated on the lower mesial angle.

The stout first segment of the peduncle of the antennula is armed distally with two long spines on the outer side, and beneath with a

short, somewhat truncated and minutely dentate process. The second segment of the peduncle of the antenna is armed with a dentiform process below and a sharp tooth on the outer side; the third segment is armed with a single large distal spine on the outside; the fourth and fifth segments are only inconspicuously armed. The flagellum is slightly compressed, more than twice as long as the carapax, and sparsely clothed with slender setæ.

The infero-mesial edge of the merus of the second gnathopod is armed with three conical spines.

The chelipeds are not very much longer than the carapax, including the rostrum, and very stout; the merus is considerably shorter than the chela and armed with a few sharp spines along the dorsal edge and at the distal end, and with numerous small tubercles; the carpus is armed somewhat like the merus, but there are more and smaller spines at the distal end; the chela is about as long as the breadth of the carapax between the hepatic spines, more than a third as broad as long, considerably compressed vertically, somewhat roughened with small tubercles, especially along the inner edge, and with the stout and straight digits making more than half the whole length. The three pairs of ambulatory peræopods are very nearly alike and a little longer than the chelipeds; the meri and carpi are roughened with small tubercles, angulated, and armed with a series of spines above; the propodi are angulated, with all the angles rough and tuberculous and the dorsal spiny; the dactyli are very stout, very slightly tapered except near the curved, acute, and chitinous tip, and armed along the lower edge with a series of stout spiniform teeth which rapidly decrease in size and become obsolete proximally. The posterior peræopods are very nearly as in the allied species.

The pleon is about as broad as the carapax, only slightly narrowed posteriorly, and the dorsum is transversely rounded and devoid of longitudinal carinæ, teeth, or spines. The second and third somites each have two slightly roughened transverse ridges upon the dorsum separated by a smooth sulcus, but the dorsa of the succeeding somites are nearly smooth. The posterior margin of the sixth somite projects in a prominent median lobe, with a smaller and much less prominent lobe either side. The exposed parts of all the pleura are sparsely tuberculous and their lower edges obtuse. The second pleuron is broader than the others and its anterior edge upturned, leaving a broad depression between it and the prolongation of the transverse carina of the dorsum, which makes a median ridge.

The telson, uropods, and pleopods are very nearly as in *M. Bairdii* and *M. rostrata*.

The eggs in the recently preserved alcoholic specimen measure 3.4 by 3.6^{mm} in less and greater diameter.

Measurements are given further on with those of the next species.

Station 2224, September 8, 1884, north latitude 36° 16′ 30″, west longitude 68° 21′, 2,574 fathoms, globigerina ooze, temperature 36.8°, one female (8563).

Mundiopsis similis, sp. nov.

This species, represented like the last by a single egg-bearing female, is very closely allied to *M. crassa*, and will possibly prove to be a variety of it. The single specimen is very much smaller than that of *crassa*, being only about three-eighths as long, but is evidently fully adult if not grown to the full size to which the species attains.

Female.—The form and proportions of the carapax are almost exactly as in the last species, but all the marginal spines are more slender and the only spines on the dorsal surface proper are a single pair on the anterior part of the gastric region; the rest of the anterior part of the carapax being only slightly roughened with minute transverse broken rugæ, while the posterior portions are armed very nearly as in *crassa*, though the carina of the posterior margin is proportionally wider and not distinctly double nor sharply crenulated.

The eyes, antennulæ, and antennæ are almost exactly as in the last species, and so are the oral appendages, except the merus of the second gnathopod, which is armed with a few scarcely spiniform tubercles in place of conical spines.

The right cheliped is considerably smaller than the left, and is apparently a reproduced appendage. The left is considerably more slender and much longer than in *crassa*, being fully once and two-thirds as long as the carapax, including the rostrum; the merus is armed along all the angles, except the outer or posterior, as well as at the distal end, with long spines; the carpus is armed dorsally with three spines at the distal end, and with one or two on the inner edge; the chela is much longer than the greatest breadth of the carapax, a third as broad as long, armed along the inner edge with two or three spines, and has the digits about half the whole length. The ambulatory peræopods are nearly alike and a little longer than in *crassa;* the meri and carpi are armed nearly as in that species, but the propodi each have only a single spine on the dorsal edge.

The whole dorsal surface of the pleon is nearly smooth, though there is a shallow transverse sulcus on second and third somites. The middle of the posterior margin of the sixth somite is truncated and less prominent than the small lobe on either side.

The eggs are apparently considerably smaller than in *crassa*, measuring 2.7 by 2.9^{mm} in the recently preserved alcoholic specimen.

Station 2192, August 5, 1884, north latitude 39° 46′ 30″, west longitude 70° 14′ 45″, 1,060 fathoms, globigerina ooze, temperature, 38.6°, one female (8255).

Vol. VIII, No. 32. Washington, D. C. Jan. 26, 1885.

Measurements in millimeters.

	M. crassa.	M. similis.
Catalogue number	8563	8255
Station	2224	2192
Sex	♀	♀
Length from tip of rostrum to tip of telson	125	45
Length of carapax, including rostrum	65	24.2
Length of rostrum	19.2	7.5
Greatest breadth of carapax, including spines	39.2	13.7
Breadth at bases of antero-lateral spines	29.4	10.5
Breadth at branchial regions	38.0	13.3
Length of eye-stalk, including spine	7.5	2.3
Length of spine	3.0	1.5
Diameter of eye	2.7	1.2
Length of right cheliped	73	37
Length of right chela	29.3	13.5
Breadth of right chela	10.9	3.2
Length of dactylus	16.8	7.1
Length of left cheliped	74.0	41
Length of left chela	29.5	15.0
Breadth of left chela	11.0	5.0
Length of dactylus	16.8	7.6
Length of first ambulatory peræopod	85	40
Length of propodus	22.0	5.9
Length of dactylus	15.4	11.3
Length of posterior peræopod	48	22
Length of telson	16.0	6.0
Breadth of telson	23.5	7.4
Length of inner lamella of uropod	13.0	5.0
Breadth of inner lamella of uropod	14.5	4.0
Length of outer lamella of uropod	14.5	5.2
Breadth of outer lamella of uropod	12.7	4.0

Bythocaris gracilis, sp. nov.

This species is closely allied to *B. Payeri* G. O. Sars, and is possibly only a variety of it, though the specimens seen differ conspicuously from specimens of *B. Payeri*, from the Faroe Channel, received from the Rev. Dr. Norman, in the size of the eyes and the form of the antennal scales.

Female.—The carapax is about two-thirds as broad as its length along the dorsum, and the front about a sixth as broad as the length and very nearly as in *B. Payeri*, but the lateral teeth are a little more prominent than in that species. The short median carina on the gastric region terminates abruptly in a small tooth anteriorly, not present in any of the specimens of *B. Payeri*. The eye-stalk and eye are about a fourth as long as the dorsum of the carapax, and the diameter of the black eye about three-fifths of the length of the stalk and eye. In the specimens of *B. Payeri* the eyes are considerably smaller, about a fifth as long as the carapax, and the diameter about half the length of the eye and stalk. The first segment of the pedunele of the antennula is armed with a very slender and acute lateral spine which reaches nearly as far forward as the segment itself. The antennal scale is fully as long as the dorsum of the carapax and less than a third as broad as long, while in *B. Payeri* it is rather shorter and considerably broader. The peræopods and pleon are very nearly as in *B. Payeri*.

The eggs in the alcoholic specimens are about 1.8 by 1.4^{mm} in longer and shorter diameter.

In the following table similar measurements of this species and a specimen of *B. Payeri* are given for comparison.

Measurements in millimeters and hundredths of length of carapax.

	B. gracilis.		B. Payeri.	
Station	2116			
Sex	♀		♀	
	Mm.	*Per cent.*	*Mm.*	*Per cent*
Length from front to tip of telson	39.0=464		50.0	476
Length of carapax	8.4	100	10.5	100
Breadth of carapax	5.5	65	6.7	64
Breadth of front	1.4	17	1.6	15
Length of eye-stalk and eye	2.0	24	2.0	19
Greatest diameter of eye	1.3	15	1.0	10
Length of antennal scale	8.5	101	9.6	92
Breadth of antennal scale	2.8	35	4.3	41
Length of sixth somite of pleon	6.1	73	8.0	76
Height of sixth somite of pleon	2.3	27	3.6	34
Length of telson	7.5	89	9.0	86
Length of inner lamella of uropod	5.6	67	7.3	70
Breadth of inner lamella of uropod	1.8	21	2.4	23
Length of outer lamella of uropod	7.0	83	8.8	84
Breadth of outer lamella of uropod	2.4	29	3.5	33

Specimens examined.

Catalogue number.	Station number.	Locality. N. lat.	Locality. W. long.	Depth in fathoms.	Temperature.	Nature of bottom.	Date.	Specimens. Number.	Specimens. With eggs.
		° ′ ″	° ′ ″		°		1883.	♂ ♀	
7132	2116	35 45 23	74 31 25	888	39	Blue mud, fine sand.	Nov. 11	1	1
							1884.		
8258	2206	39 35 00	71 24 30	1043	38	Green mud	Aug. 20	1	1

Bythocaris Payeri and the following species, *B. nana*, differ remarkably from *Hippolyte* and the allied genera in the reduced number of the branchiæ and epipods. There are no epipods proper at the bases of any of the gnathopods or peræopods, and no podobranchiæ nor arthrobranchiæ on any of the somites, as the following branchial formula shows:

	Somites. VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Total.
Epipods	1	0	0	0	0	0	0	0	(1)
Podobranchiæ	0	0	0	0	0	0	0	0	0
Arthobranchiæ	0	0	0	0	0	0	0	0	0
Pleurobranchiæ	0	0	0	1	1	1	1	1	5
									5+(1)

Bythocaris nana, sp. nov.

This is a small species, at once distinguished from *B. Payeri* and *B. gracilis* by the very much broader and differently shaped front, and the much longer eye-stalks.

The carapax is about three-fourths as broad as its length along the dorsum, and the breadth of the front fully a third of the length. The supraorbital teeth are very large, and project as far forward as the very small rostral tooth. The median carina of the gastric region is low and inconspicuous.

The eyes are well developed, placed obliquely upon the stalks, and black. The length of the eye and stalk is about equal to the breadth of the front, and the diameter of the eye considerably greater than that of the stalk, equalling about a fifth the length of the carapax. The first segment of the peduncle of the antennula reaches a little beyond the eye, and its lateral spine is slender and falls considerably short of the distal end of the segment itself. The outer flagellum is very stout in both sexes, and tapers rapidly to a very slender tip, reaching to, or a little beyond, the tip of the antennal scale. The inner flagellum is very slender, and slightly longer than the outer. The antennal scale is shorter than the dorsum of the carapax, a little more than a third as broad as long, and has the tip more elongated than in the last species. The flagellum of the antenna is very slender, subcylindrical, and much longer than the body of the animal.

The endopod of the second gnathopod reaches nearly to the tip of the antennal scale; the distal and proximal of the three segments of which it is composed are approximately equal in length; the middle segment is about two-fifths as long as the proximal, and the exopod scarcely reaches to the middle of the proximal segment of the endopod and is very slender. The first peræopods reach to near the tips of the peduncles of the antennæ; the carpus and chela are together as long as the rest of the endopod; the chela is about once and two-thirds as long as the carpus, slightly stouter, about a fourth as broad as long, and the digits slender and a little less than half as long as the whole length of the chela. The second peræopods are very slender and reach considerably beyond the antennal scales; the ischium and merus are subequal in length; the carpus is a little less than twice as long as the merus, and composed of eight segments; the chela is nearly cylindrical and about once and two-thirds as long as the distal segment of the carpus and no stouter. The third, fourth, and fifth peræopods are nearly alike, and about as long as the second; the meri and propodi are subequal in length, and the meri are armed with three to seven spines along the distal part of the lower edge; the lower edges of the propodi are clothed with a few plumose hairs, and armed with several very slender spines; the dactyli are approximately a fourth as long as the propodi, slightly curved, regularly tapered to an acute tip, and armed along the lower edge with a regular series of spinules.

The pleon is somewhat geniculated and slightly compressed dorsally at the third somite, but none of the somites are carinated. The telson is a little shorter than the sixth somite, evenly rounded above, and regularly tapered to a narrow truncated tip armed with six slender spines, of which the sublateral pair are much larger than the lateral and median.

The eggs, in the alcoholic specimens, are approximately 1.0 by 0.8^{mm} in longer and shorter diameter.

Many of the specimens, after long preservation in alcohol, show dark bands of pigment spots across the antennal scales, uropodal lamellæ, and somites of the pleon.

This is the species to which I have referred as *Bythocaris*, sp. indet., in Proc. National Mus., iii, p. 437, 1881, and Bull. Mus. Comp. Zool., x, p. 55, 1882.

Measurements in millimeters and hundredths of length of carapax.

Station	878.		878.	
Sex	♂		♀	
	Mm.	*Per cent.*	*Mm.*	*Per cent.*
Length from front to tip of telson	25.5=455		25.0=455	
Length of carapax	5.6	100	5.5	100
Breadth of carapax	4.3	77	4.2	76
Breadth of front	2.0	36	1.9	35
Length of eye-stalk and eye	2.0	36	1.9	35
Greatest diameter of eye	1.1	20	1.1	20
Length of antennal scale	5.0	89	4.6	84
Breadth of antennal scale	1.8	32	1.7	31
Length of sixth somite of pleon	4.1	73	4.0	73
Height of sixth somite of pleon	1.7	30	1.8	33
Length of telson	4.9	87	5.0	91
Length of inner lamella of uropod	3.8	68	3.8	69
Breadth of inner lamella of uropod	1.1	20	1.1	20
Length of outer lamella of uropod	4.2	75	4.3	78
Breadth of outer lamella of uropod	1.3	23	1.4	26

Specimens examined.

Station number.	Locality. N. lat.	Locality. W. long.	Depth.	Temperature.	Nature of bottom.	Date.	Specimens. Number.	Specimens. With eggs.
	OFF MARTHA'S VINEYARD.							
	° ′ ″	° ′ ″	*Fath.*	°		1880.	♂ ♀	
865	40 05 00	70 23 00	65	63	Fine sand, mud	Sept. 4	3 5	5
872	40 05 39	70 23 52	86	50½	Sand, gravel, shells, sponges	Sept. 4	2	1
874	40 00 00	70 57 00	85	51	Soft mud	Sept. 13	1	....
878	39 55 00	70 54 15	142	52	Mud	Sept. 13	2 6	6

Hymenodora glacialis G. O. Sars.

Pasiphaë glacialis Buchholz, Zweite deutsche Nordpolfahrt, ii, p. 279, pl. 1, fig. 1, 1874.

Hymenodora glacialis G. O. Sars, Archiv Mathem. Naturvid., Kristiana, ii, p. 341, 1877. Norman, Proc. Royal Soc. Edinburgh, 1881–'82, p. 684, 1882.

A few specimens from the Albatross dredgings of 1883 were doubtfully referred to this species, but Buchholz's erroneous figures and Sars's short diagnosis left the identification so uncertain that I did not mention them in the published report. Authentically labeled specimens from the Faroe Channel, recently received from the Rev. A. M Norman, to whose kindness in sending them I am greatly indebted, confirm the identification, however, and enable me to positively refer the genus to the Acanthephyrinæ and to compare the single species with the closely allied forms, and particularly with my genus *Meningodora*.

The eye-stalks and eyes are very similar to those of *Meningodora mollis*, but the eyes are apparently a little smaller and are reddish instead of black in recently preserved alcoholic specimens.

The mandibles are similar to those of *Meningodora mollis*, but still more like those of *Acanthephyra Agassizii*, the mesial edges being armed very nearly as in that species. The distal segment of the protognath of the first maxilla is very much broader than in *Meningodora mollis* or any of the species of *Acanthephyra* which I have examined, the mesial edge being fully as long as that of the proximal segment, which, however, is considerably narrower mesially than in *Meningodora mollis;* the endognath is like that of the *Meningodora*. The two divisions of the distal segment of the protognath of the second maxilla are nearly equal and much broader and shorter than in *Meningodora mollis*, and do not project mesially beyond the proximal segment, as they do in the species of *Acanthephyra*, *Meningodora*, *Notostomus*, and *Ephyrina:* otherwise the second maxillæ do not differ from those of *Meningodora*. The maxillipeds differ essentially from those in the allied genera in having the endopod composed of two segments only, a very short proximal segment and a long unsegmented distal one.

The first gnathopods bear no podobranchiæ, and the distal part of the endognath differs from that of *Meningodora mollis* in having the dactylus nearly as long as broad and attached to the propodus by a much less oblique articulation. The number and arrangement of the branchiæ and epipods on the succeeding somites are the same as in the allied forms, so that there are in all, on each side, six epipods, six arthrobranchiæ, and five pleurobranchiæ. The second gnathopods and first and second peræopods do not differ essentially from those of *Meningodora mollis*, although the second peræopods are less slender and more like the first than in that species, and both pairs are somewhat more hairy. The third and fourth peræopods are more like those of *Acanthephyra Agassizii* than those of *Meningodora mollis*, being armed with small spines and setæ, and the propodi and dactyli neither grooved

conspicuously nor carinated. The fifth peræopods are shorter and stouter than in *Meningodora* and very distinctly subchelate, the stout and conspicuous, though short, dactylus closing against a digital process of the propodus fully half its own length.

The dorsum of the pleon is neither carinated nor toothed. The pleura of the second somite are not as figured by Buchholz, but overlap those of the first and third as in the allied genera, and the pleura of the third, fourth, and fifth somites are evenly and similarly rounded posteriorly.

Specimens examined.

Catalogue No.	Station No.	Locality. N. lat. °	′	″	W. long. °	′	″	Depth.	Temperature.	Nature of bottom.	Date.		Specimens.* ♂	♀		With eggs.
								Fath.	°		1883.					
7158	2036	38	52	40	69	24	40	1735	38	Globigerina ooze	July	18	1			
7159	2039	38	19	26	68	20	20	2369		Globigerina ooze	July	28		2f.		
7160	2083	40	26	40	67	05	15	959	40	Gray mud	Sept.	5	1	1y.		
7161	2083	40	26	40	67	05	15	959	40	Gray mud	Sept.	5		2y.		
7017	2095	39	29	00	70	58	40	1342		Globigerina ooze	Sept.	30	1		2	1
7162	2099	37	12	20	69	36	00	2949		Globigerina ooze	Oct.	2	1f.			
5456	2099	37	12	20	69	36	00	2949		Globigerina ooze	Oct.	2	1	2f.	1	
7018	2100	39	22	00	68	34	30	1628	37	Globigerina ooze	Oct.	3	1	2f.		
5467	2101	39	18	30	68	24	00	1686	37	Globigerina ooze	Oct.	3		3y.		
7151	2116	35	45	23	74	31	25	888	39	Brown mud, fine sand.	Nov.	11	1			
											1884.					
7974	2182	39	25	30	71	44	00	861	39	Green mud.....	July	23	1			
8337	2193	39	44	30	70	10	30	1122	38	Green mud.....	Aug.	5		1s.		

*After the number of specimens, y indicates young, s, small, and f, fragmentary.

Acanthephyra microphthalma, sp. nov.

The carapax is scarcely as broad in front as at the middle of the branchial region, and is neither compressed nor carinated dorsally, but broadly rounded, except at the high and laterally compressed base of the very slender rostrum, which is strongly upturned, wholly unarmed above except by three very obscure teeth above the orbit, and armed beneath with a series of about seven small and nearly equidistant teeth on the distal two-thirds of the length, but not quite reaching the very slender and acute tip. The orbital sinus is much smaller than in *A. Agassizii*, the lobe beneath is much broader and somewhat truncated, and the antennal and branchiostegial spines are less prominent.

The eye-stalks are much shorter than in *A. Agassizii*, strongly tapered from near the base to the minute brownish eyes, which are placed obliquely upon the outer side of the tip of the stalk.

The proximal segment of the peduncle of the antennula is less deeply excavated for the reception of the eye than in *A. Agassizii*, and the expanded proximal portion of the outer flagellum is a little narrower, but otherwise the antennula is as in that species.

The antennal scale is about two thirds as long as the carapax excluding the rostrum, near the base about a fourth as broad as long, and

narrowed to a truncated tip about a third as broad as the base. The spine upon the second segment of the peduncle below the articulation of the scale is much shorter than in *A. Agassizii*.

The oral appendages differ only slightly from those of *A. Agassizii*. The mandibles are thicker and heavier, the opposing edges of the ventral processes a little narrower, and their teeth fewer in number, thick and obtuse, and the terminal segment of the palpus is a little narrower. The mandibles are in fact more like those of *A. eximea*. The fold on the ventral side near the tip of the endopod of the first maxilla is armed, in place of the two to four short spines in *A. Agassizii*, with a series of ten to twelve setæ, of which the proximal are stout, and somewhat spiniform, but the distal very slender. The two lobes of the distal segment of the protognath and the endognath of the second maxilla are slightly more slender than in *A. Agassizii*. The anterior lobe of the scaphognath is much longer and narrower, contracted near the middle and slightly expanded at the obtuse and somewhat truncated tip, while the posterior lobe is slightly broader. The endopods and exopods of the maxillipeds are much longer and more slender than in *A. Agassizii*, but these appendages do not differ in other respects. The propodus and dactylus of the first gnathopod are a little more narrowed distally, and the line of articulation between them slightly less oblique than in *A. Agassizii*. The second gnathopods differ scarcely at all.

The peræopods are similar to those of *Acanthephyra Agassizii*, but are a little more slender, somewhat less hairy, and the proportions of the segments slightly different: the carpus in the second pair is nearly as long as the merus and much longer than the chela, which is considerably shorter and much more slender than in the first; and the carpi in the third, fourth, and fifth pairs are relatively shorter than in *A. Agassizii*.

The first and second somites of the pleon are rounded above, but the third and fourth are very strongly compressed dorsally and project in a very high and sharp crest, highest at the articulation between the two somites and on the third produced into a very long, slender, compressed, and spiniform tooth which is arched over nearly or quite the whole length of the fourth somite, which is itself without any carinal tooth. The fifth and sixth somites are sharply carinated dorsally, but the carina does not project in a tooth or spine on either. The pleura are of about the same form as in *A. Agassizii*, but are somewhat less deep.

The telson is very long and slender, only very obscurely sulcated above, armed with seven or eight pairs of small dorsal aculei, and tipped with three to five slender spines between a pair of much larger lateral ones.

The uropods and pleopods are nearly as in *A. Agassizii*, but the ovate inner lamelliform ramus of the first pleopod of the male is a little narrower and the marginal stylet reaches slightly beyond the tip of the lamella itself.

Measurements in millimeters.

Sex	♂	♀
Length from tip of rostrum to tip of telson	98	100.0
Length of carapax, including rostrum	40	41.0
Length of rostrum	22.5	22.0
Length of carapax, excluding rostrum	22.0	22.8
Height of carapax	13.5	13.5
Breadth of carapax at branchiostegial spines	9.0	8.7
Greatest breadth of carapax	9.8	9.9
Length of eye-stalk and eye	2.7	2.8
Greatest diameter of eye	0.8	0.8
Length of antennal scale	14.5	15.0
Breadth of antennal scale	3.6	3.7
Length of second gnathopod	22.0	.....
Length of first peræopod	18.0	.....
Length of chela	3.6	.....
Breadth of chela	0.9	.....
Length of dactylus	1.2	.....
Length of second peræopod	21.0	.....
Length of chela	3.4	.....
Breadth of chela	0.7	...
Length of dactylus	1.1	.....
Length of third peræopod	25.0	.....
Length of propodus	6.4	.....
Length of dactylus	1.7	.....
Length of fourth peræopod	24.0	.....
Length of propodus	6.1	.....
Length of dactylus	1.6	.....
Length of fifth peræopod	22.0	.....
Length of propodus	7.5	.....
Length of dactylus	0.3	...
Height of third somite of pleon	16.0	17.0
Length of its dorsal spine	9.5	10.0
Length of sixth somite of pleon	10.5	10.8
Height of sixth somite of pleon	6.0	5.9
Length of telson	17.0	17.0
Length of inner lamella of uropod	12.1	12.5
Breadth of inner lamella of uropod	2.7	.....
Length of outer lamella of uropod	13.4	14.0
Breadth of outer lamella of uropod	3.3	.....

Station 2224, September 8, 1884, north latitude 36° 16′ 30″, west longitude 68° 21′, 2,574 fathoms, globigerina ooze, temperature 36°.8, two males and two females (8584).

Acanthephyra brevirostris, sp. nov.

This species is at once distinguished from the others of the genus by the very short rostrum (which, though considerably longer, strikingly recalls that of *Hymenodora glacialis*), and the very large, laterally compressed, and carinate tooth of the third somite of the pleon. All the specimens are in bad condition, very largely due, apparently, to the soft and membranaceous character of the integument, which resembles that of *Meningodora mollis* and several other deep-water species.

The carapax proper is higher and more compressed at the base of the rostrum than in *A. Agassizii* and the branchiostegial spines are less prominent. The rostrum is approximately a fourth as long as the rest of the carapax, very high at base as in *A. eximea*, acutely triangular in a side view, terminates in a slender and slightly upturned tip, and is unarmed below but armed above, at base and back upon the carina of the carapax, with a series of five or six very small and obscure teeth.

The eye-stalks are a little shorter than in *A. Agassizii* and the eyes a little smaller, but broader than the stalks, somewhat compressed verti-

cally, face obliquely inward and forward, and are black or brownish black. The peduncle of the antenna and its scale are nearly like those of *A. microphthalma.*

The oral appendages are very nearly as in *A. Agassizii.* The opposing edges of the ventral processes of the mandibles are a little narrower, almost exactly alike on the two sides, armed with about seven teeth each, and without the small anterior teeth seen in *A. Agassizii.* The first maxillæ show no differences. The divisions of the distal segment of the protognath of the second maxilla are very slightly broader than in *A. Agassizii*, the endognath and the anterior lobe of the scaphognath are both considerably longer and the posterior lobe of the scaphognath slightly narrower. The exopod of the maxilliped does not reach beyond the endopod and the tip is broader and more truncated than in *A. Agassizii.* The gnathopods do not differ essentially from those of *A. Agassizii.*

The peræopods are very similar to those of *A. Agassizii*, but are all considerably longer and more slender; the first reach to the middle of the antennal scale, the fourth to considerably by its tip, and the fifth to about the same point as the first.

The pleon is smaller relatively to the cephalo-peræon than in *A. Agassizii* and the third somite very differently armed. The first and second somites are rounded above, but the third is strongly compressed dorsally into a very high and sharp carina which projects in a great laterally compressed tooth high at base, tapered to an acute point and overhanging the fourth somite and part of the fifth. The fourth, fifth, and sixth somites are compressed and armed with a sharp carina which projects posteriorly in a conspicuous tooth on the fourth, and in a similar but much smaller tooth on the fifth and sixth. The pleura are similar to those of *A. Agassizii*, but relatively less deep, the second is considerably broader, and the third, fourth, and fifth more produced and more evenly rounded posteriorly.

The telson is very long and slender, only very obscurely sulcated above, armed with approximately five pairs of minute dorsal aculei and tipped with three slender spines between a pair of much larger lateral ones with a small subterminal spine near the base of each.

The uropods and pleopods are nearly as in *A. Agassizii.*

Measurements in millimeters.

Station	2105.	2099.
Sex	♂	♀
Length from tip of rostrum to tip of telson	65	77
Length of carapax including rostrum	23.0	26.0
Length of rostrum	5.1	6.9
Height of carapax	10.6	11.7
Length of eye-stalk and eye	2.8	3.1
Greatest diameter of eye	1.5	1.8
Length of antennal scale	10.7	12.1
Breadth of antennal scale	3.1	3.6
Length of second gnathopod	.....	21

Measurements in millimeters—Continued.

Station	2105.	2099.
Sex	♂	♀
Length of first peræopod	17.5	19.0
Length of chela	3.9	4.4
Breadth of chela	0.8	0.9
Length of dactylus	1.2	1.3
Length of second peræopod	20	22
Length of chela	4.2	4.9
Breadth of chela	0.5	0.6
Length of dactylus	1.2	1.4
Length of third peræopod	.....	27.0
Length of propodus	.....	8.0
Length of dactylus	.....	1.9
Length of fourth peræopod	26	.....
Length of propodus	7.1	.....
Length of dactylus	2.1	.....
Length of fifth peræopod	21	25
Length of propodus	7.6	8.7
Length of dactylus	0.5	0.6
Height of third somite of pleon	11.0	12.0
Length of its dorsal spine	8.4	9.0
Length of sixth somite of pleon	8.2	9.3
Height of sixth somite of pleon	4.6	5.2
Length of telson	14.0	15.3
Length of inner lamella of uropod	9.7	.....
Breadth of inner lamella of uropod	2.1	2.5
Length of outer lamella of uropod	10.6	11.0
Breadth of outer lamella of uropod	2.8	3.1

Specimens examined.

Catalogue No.	Station No.	Locality. N. lat.			Locality. W. long.			Depth.	Temperature.	Nature of bottom.	Date.	Specimens. ♂	Specimens. ♀	Specimens. With eggs.
		°	′	″	°	′	″	*Fath.*	°		1883.			
5448	2099	37	12	20	69	39	00	2949	.....	Globigerina ooze	Oct. 2	.....	2	1
5449	2101	39	22	00	68	34	30	1686	37	Globigerina ooze	Oct. 3	1	.....	.....
5673	2105	37	50	00	73	03	50	1395	41	Globigerina ooze	Nov. 6	1	.....	.....

Ephyrina, gen. nov.

This genus, which is based on a single specimen, wanting the greater part of the second, third, and fourth peræopods, is readily distinguished from *Acanthephyra* by the ischial and meral segments of the fifth peræopods, which are compressed, very broad, and form broad lamellar opercula along the sides of the carapax. The single species is further distinguished by the unarmed rostrum, the non-carinated pleon, and the broad anterior division of the distal segment of the protognath of the second maxilla. In all other characters it agrees essentially with the species of *Acanthephyra*.

Ephyrina Benedicti, sp. nov.

In general the form of the carapax proper is very similar to that of *Acanthephyra Agassizii*, but the antennal and branchiostegial spines are less prominent. An obtuse dorsal carina extends forward from near the posterior margin and gradually rises in front into a very high and sharp carina at the base of the laterally compressed lamellar rostrum.

which is short, not reaching beyond the peduncle of the antennula, acutely triangular in a side view, considerably upturned, and wholly unarmed.

As in *Acanthephyra Agassizii*, the eye-stalks are short and terminated by small hemispherical black eyes, which face slightly inward when the stalks are directed forward.

The antennulæ, too, are very nearly as in *Acanthephyra Agassizii*, except that the proximal portion of the outer flagellum is much less expanded, though very much stouter than the inner. The antennal scales are imperfect at the tips, but are less rapidly narrowed distally, and are apparently more nearly as in *Acanthephyra microphthalma*.

The mandibles are essentially as in *Acanthephyra Agassizii*, but are very nearly alike on the two sides, the posterior part of the mesial edge of the ventral process in each being armed with six or seven acutely triangular teeth, in front of which the margin is sharp and chitenous, but not serrated, though there is a small tooth at the anterior end of this unserrated edge in the right mandible and a sharp angle at the same point in the left. The first maxillæ are very like those of *Acanthephyra Agassizii*. The anterior division of the distal segment of the protognath of the second maxilla is much expanded at the mesial edge, where it projects farther forward and is more than twice as broad as the posterior division; the endognath is more slender; the anterior lobe of the scaphognath is a little narrower and more evenly rounded at the end. The maxillipeds do not differ from those of *A. Agassizii*, except that the antero-mesial angle of the exopod is a little more obtusely rounded, nor the first gnathopods, except the distal part of the endopod, which is more nearly as in *Acanthephyra gracilis*, the dactylus being longer than broad and terminally attached to the propodus by a slightly oblique articulation. The second gnathopods are imperfect at the tips, but are evidently very nearly as in *Acanthephyra Agassizii*, and apparently reach to about the tips of the antennal scales.

The first peræopods are about as long as the carapax including the rostrum, and are clothed with numerous hairs; the ischium and merus make about half the length of the endopod, and are strongly compressed and broad, the merus being considerably more than a third as broad as long; the carpus is about three-fifths as long and half as broad as the merus; the chela is somewhat stouter than the carpus, not far from twice as long, and tapered distally to the bases of the digits, which are about a third of the whole length, very slender and strongly curved at the tips. The fifth peræopods are about a fourth longer than the first and are clothed with very few hairs; the ischium and merus make fully half the entire length; both are broad and strongly compressed, and the latter is fully a third as broad as long, with the dorsal margin nearly straight and the ventral strongly curved upward to the articulation with the carpus, which is very slender and scarcely longer than the breadth of the merus; the propodus is about twice as long as the carpus and no stouter; the dactylus, exclusive of the terminal spines and

setæ, is stout and about twice as long as the distal diameter of the propodus.

There is no carina on any somite of the pleon, but the dorsum of the third somite projects back in a small, vertically compressed spine over the fourth somite, in the dorsum of which there is an obscure, and possibly accidental, sulcus. The pleura are similar in outline to those of *Acanthephyra Agassizii*, but the second is relatively a little broader, the third and fourth more evenly rounded posteriorly, and the fifth a little more obtuse at the posterior angle. The sixth somite is about two-thirds as long as the carapax, excluding the rostrum, and less than half as high as long.

The telson is very much longer than the sixth somite, tapers into a very long and narrow tip, and is armed along the distal two-thirds of either edge with numerous (twenty to twenty-five) small aculei. The inner lamellæ of the uropods are about as long as the sixth somite of the pleon, lanceolate in outline, and less than a sixth as broad as long. The outer lamellæ reach to near the tip of the telson, are about six times as long as broad, and evenly rounded at the tips.

Measurements in millimeters.

Sex	♀
Length from tip of rostrum to tip of telson	56.0
Length of carapax, including rostrum	17.0
Length of rostrum	4.8
Length of carapax, excluding rostrum	13.2
Height of carapax	8.3
Breadth of carapax	6.2
Length of eye-stalk and eye	2.8
Greatest diameter of eye	1.7
Length of first peræopod	16.0
Length of merus	4.6
Breadth of merus	1.7
Length of carpus	2.9
Length of chela	5.0
Breadth of chela	0.8
Length of dactylus	1.8
Length of fifth peræopod	20.5
Length of merus	7.5
Breadth of merus	2.7
Length of carpus	2.3
Length of propodus	5.8
Length of dactylus	0.8
Length of sixth somite of pleon	8.8
Height of sixth somite of pleon	4.1
Length of telson	11.6
Length of inner lamella of uropod	8.6
Breadth of inner lamella of uropod	1.3
Length of outer lamella of uropod	9.5
Breadth of outer lamella of uropod	1.6

Station 2083, September 5, 1883, north latitude 40° 26′ 40″, west longitude 67° 5′ 15″, 959 fathoms, gray mud, temperature 40°, one female (7156).

Benthœcetes Bartletti Smith.

Benthesicymus? Bartletti Smith, Bull. Mus. Comp. Zool., x, p. 82, pl. 14, figs. 1–7, 1882.

Benthœcetes Bartletti Smith, Report U. S. Fish Com., x, for 1882, p. 391, pl. 10, fig. 8, 1884.

Additional specimens of this species taken the present season show that the dactyli of the fourth and fifth peræopods are, as I had supposed,

normally very slender, but not multiarticulate nor very long in either sex, and that the flagella of the antennula are very long, apparently much longer than the body.

Benthonectes, gen. nov.

This generic name is proposed for a species apparently very closely allied to that figured by A. Milne-Edwards as "*Benthesicymus Bartletti* (Smith)?" and probably specifically identical with it. The genus is closely allied to *Benthœcetes* and is specially characterized by the multiarticulate flagelliform dactyli of the fourth and fifth peræopods. It is further distinguished from allied genera by the acute ventral process of the crowns of the mandibles and the narrow mandibular palpi; and probably, also, by the presence of an hepatic spine upon the carapax, the large reniform eyes, the equal lobes of the protognath of the second maxillæ, the absence or obsolescence of the third segment of the endopod of the maxilliped, the narrow merus of the first gnathopod, and the styliform dactylus of the second gnathopod. Like that of *Benthœcetes*, the relation to Bates' imperfectly described *Benthesicymus* is largely problematical, but Bates' genus is described as having the eyes "not large," the eye-stalks flattened and furnished with a conspicuous tubercle, and the flagella of the antennula "not longer than the carapax" (although under the second species these flagella are said to be "half as long as the animal"), characters which I should not expect to find in species congeneric with the one here described.

Benthonectes filipes, sp. nov.

The carapax is similar to that of *Benthœcetes Bartletti* in general form, but is considerably narrower and less expanded posteriorly. The dorsum is carinated or slightly angulated to near the posterior border, and rising anteriorly projects forward in a rostrum almost exactly as in that species except that it is a very little longer, so as to slightly overreach the eyes, and the lower edge is more nearly horizontal. The inferior angle of the orbit is slightly more acute, the antennal spine a little larger and a little farther forward, and there is in addition an hepatic spine nearly as large as the antennal.

The eye-stalks are relatively short, and the very dark-brown eyes, large, swollen, reniform, project over the ends of the stalks and extend proximally along their mesial sides more than half way to the bases of the stalks, the greatest diameter of the eye being at least three-fourths of the whole length of the stalk. There is a small and inconspicuous tubercle on the mesial side of the stalk just back of the edge of the eye. The antennal scales are considerably narrower than in *Benthœcetes Bartletti*, but otherwise the antennæ and antennulæ are essentially as in that species. The flagella of the antennula are approximately equal in length, much longer than the body of the animal and very slender, while the flagellum of the antenna is very much longer and almost equally slender.

The oral appendages are similar to those of *Benthæcetes Bartletti*, but show some important differences. The ventral process of the crown of the mandible, instead of being truncated at the anterior angle, is prolonged into an acute angular process which closes by a similar process of the opposite side. The palpus is very different in form; the proximal segment is narrow, about three times as long as broad, reaches to about the tip of the crown, and expands very slightly distally; the distal segment is only about half as long as the proximal and about as wide at base, but the inner edge is obliquely truncated from just below the middle so that the obtuse tip is narrow. The first maxillæ differ only very slightly and unessentially. The endognath and epignath of the second maxillæ differ very little, but the four lobes of the protognath are very much more nearly alike, the distal lobe being only a very little broader than the others, while the proximal is very much like the others, being as long as the one next it and not narrowed toward the rounded tip. The endognath of the maxilliped is a little shorter and the small terminal segment either wanting or very obscure; the exopod is shorter and suddenly narrowed into a short and slender flagelliform tip. The exopod of the first gnathopod is very much smaller, being very slender and considerably shorter than the endopod. The endopod of the second gnathopod is more slender and armed with longer and stronger spines, and the dactylus is very different, being nearly two-thirds as long as the propodus, slender, subcylindrical, and strongly tapered distally, where it is armed with several slender spines nearly as long as itself.

The chelate peræopods are similar to those of *Benthæcetes Bartletti*, but considerably longer and more slender, the first pair reaching considerably by the tips of the second gnathopods. The fourth and fifth peræopods are very long, exceedingly slender, and the proximal portions nearly as in *Benthæcetes Bartletti*. The carpi in the fifth pair are considerably longer than the meri; the propodi in the fourth are much shorter than the carpi, and in the fifth not half as long as the carpi; the dactyli are slender, multiarticulate, flagelliform, and very long, being in the fourth pair fully three times as long as the propodi. The number and arrangement of the branchiæ and epipods are the same as in *Benthæcetes Bartletti*, but there are small rudimentary exopods at the bases of all the peræopods, as in *Benthesicymus ? carinatus*.

The pleon is very similar to that of *Benthæcetes Bartletti* except that there is no spine on the fifth somite. The dorsum is evenly rounded on the first four somites, but on the fifth and sixth there is a sharp median carina which projects posteriorly in a very slight angle on each of these somites. The epimera are all somewhat smaller than in *Benthæcetes Bartletti*, and the posterior edges of the fourth and fifth project much less and are broadly rounded. The sternum of the first somite is armed with a laterally compressed mesial process somewhat as in that species, but longer and obtuse. The pleopods have very long and slender rami, as in *Benthæcetes Bartletti*, but the appendage (petasma) of the

first pair in the male is very different, being as long as the protopod to which it is attached, very narrow, and acutely triangular at the tip.

Measurements in millimeters.

Catalogue number	8559	8020
Station	2235	2181
Sex	♂	♂
Length from tip of rostrum to tip of telson	82	63
Length of carapax including rostrum	25.7	32.0
Length of rostrum	6.0	5.8
Height of carapax	12.8	9.6
Breadth of carapax	11.0	8.0
Length of eye-stalk and eye	5.0	4.1
Greatest diameter of eye	3.7	3.3
Length of antennal scale	15.8	13.5
Breadth of antennal scale	5.1	4.0
Length of second gnathopod	24	20
Length of propodus	2.9	2.5
Length of dactylus	2.0	1.7
Length of first peræopod	27	21
Length of carpus	6.0	4.8
Length of chela	5.4	4.6
Breadth of chela	1.0	0.9
Length of dactylus	2.5	2.1
Length of second peræopod	34	27
Length of carpus	10.0	8.2
Length of chela	6.0	5.0
Breadth of chela	0.9	0.7
Length of dactylus	2.8	2.5
Length of third peræopod	44	32
Length of carpus	13.7	10.0
Length of chela	7.4	5.5
Breadth of chela	0.8	0.6
Length of dactylus	4.8	3.0
Length of fourth peræopod	67	50
Length of merus	13.3	12.0
Length of carpus	11.0	8.4
Length of propodus	7.5	6.0
Length of dactylus	25.0	18.5
Length of fifth peræopod	64+	.....
Length of merus	13.0	.....
Length of carpus	16.5	.....
Length of propodus	7.7	.....
Length of dactylus	15+	.....
Length of sixth somite	13.8	11.0
Height of sixth somite	7.0	5.4
Length of telson	11.0	9.3
Length of inner lamella of uropod	11.5	9.2
Breadth of inner lamella of uropod	2.8	2.3
Length of outer lamella of uropod	16.4	14.8
Breadth of outer lamella of uropod	4.5	3.6

Specimens examined.

Catalogue number.	Station number.	Locality. N. lat.	Locality. W. long.	Depth.	Temperature.	Nature of bottom.	Date.	Specimens. ♂	Specimens. ♀
		° ′ ″	° ′ ″	*Fath.*	°		1884.		
8020	2181	39 29 00	71 46 00	693	39	Gray mud, fine sand	July 23	1 s.	....
8265	2206	39 35 00	71 24 30	1,043	38	Green mud	Aug. 20	....	1
8266	2210	39 37 45	71 18 45	991	38	Gray globigerina ooze	Aug. 21	1 s.	....
8559	2235	39 12 00	72 03 30	707	39	Green mud	Sept. 13	1	....

NEW HAVEN, CONN., *October* 30, 1884.

DESCRIPTION OF THREE NEW FISHES FROM KANSAS.

By CHARLES H. GILBERT.

The material upon which the following descriptions are based was collected in the tributaries of the Kansas and Arkansas Rivers, in the State of Kansas, by Prof. F. W. Cragin. The species were described by me in a paper on the Fishes of Kansas, published in the "Bulletin of the Washburn Laboratory of Natural History" for September, 1884, pp. 10–16, the descriptions being republished here for convenience of reference.

Amiurus cragini,* sp. nov.

Closely related to *Amiurus brunneus* Jordan. Body rather high and compressed, much as in *A. catus*, which the present species much resembles in appearance. Profile straight, but not steep, from snout to front of dorsal. Head depressed, flat and narrow, becoming little narrower forwards, its greatest width $1\frac{2}{3}$ in its length, the depth at occiput $1\frac{3}{5}$. Upper jaw the longest, conspicuously projecting beyond the lower. Outline of gape strongly convex forwards, the width of mouth equaling interorbital width, slightly less than half length of head. Eye small, $3\frac{3}{4}$ in interorbital width, $7\frac{1}{2}$ in head. Maxillary barbel reaching beyond basal third of pectoral spine; inner mental barbels scarcely reaching margin of branchiostegal membrane, the outer slightly beyond it. Top of head with a longitudinal median groove extending from snout to occiput, bounded by two strong, nearly parallel ridges.

Dorsal fin high, its longest ray $\frac{2}{3}$ in head, the spine weak, not serrated, $2\frac{2}{3}$ in head, slightly more than half the space between dorsal and adipose fin. Pectoral spines short, with a few weak serræ on inner margin, smooth without, their length about equaling dorsal spine. Ventrals nearly reaching the front of the anal, which is short, its base 5 in length. Caudal somewhat mutilated, apparently emarginate, with the upper lobe the longest.

Head $3\frac{2}{5}$ in length; depth $4\frac{1}{5}$. A. 17.

Color in spirits: Very light brownish above and on sides, belly and lower side of head silvery; the back and top of head darker than the sides, which are dusted with fine brown points. Fins and barbels dusky.

A single specimen, 5 inches long, from "the Lake" (a blind arm of the Arkansas River), at Garden City, Kans.

Type specimen numbered 36814 on the catalogue of the U. S. National Museum.

* On examination of more material, and comparison with specimens from various localities, this proves to be a synonym of the widely distributed *Amiurus melas* Raf. The small size of the spines has not before been pointed out as a mark of this species. In specimens from the same locality as the one above noted, the anal fin has 19 rays.

Vol. VII, No. 33. Washington, D. C. Jan. 16, 1885.

Cliola (Hybopsis) topeka, sp. nov.

Body compressed, the back elevated, the anterior profile convex from dorsal forward to occiput, which is depressed. Snout rather blunt, not at all projecting beyond the mouth, which is terminal, oblique, and very small; maxillary not reaching beyond vertical from nostril, about $4\frac{3}{4}$ in length of head. Eye equaling snout, $4\frac{1}{5}$ in head; interorbital width $2\frac{3}{4}$. Teeth 4–4, with well-developed grinding surface.

Insertion of ventrals directly under origin of dorsal, which is much nearer tip of snout than base of caudal; highest dorsal ray $1\frac{1}{7}$ in head. Caudal broad with many rudimentary basal rays above and below, the longest ray about equaling head. Pectorals reaching ventrals, and the latter to vent (both these fins shorter in one specimen).

Scales large, not high nor very closely imbricated, of uniform size throughout: 14 scales before dorsal; lateral line straight, not at all decurved, rising very slightly immediately behind head.

Head 4 to $4\frac{1}{5}$ in length; depth $3\frac{3}{5}$. D. 8, A. 7; Lat. l. $35\frac{5}{4}$.

Olivaceous, more or less silvery on middle of sides, scales of back with dusky margins; a dark vertebral streak; a dusky streak, formed by coarse dark points, runs from snout through eye across opercles and along middle of sides to tail, where it ends in a small dusky spot. Fins unmarked. This species resembles somewhat *Cliola straminea*, but differs conspicuously in the greater depth, smaller eye, and in its terminal, oblique, smaller mouth.

Three specimens, $2\frac{1}{2}$ inches long, from Shunganunga Creek, tributary of Kansas River.

Type specimen numbered 36609 on the catalogue of the U. S. National Museum.

Minnilus (Lythrurus) nigripinnis, sp. nov.

Body very high, the back moderately compressed, and much elevated, rising in a strong curve from occiput to front of dorsal; supra-orbital region depressed, the profile of top of head concave; snout convexly rounded, rather short and blunt. Mouth terminal, wide, very oblique, the lower jaw slightly included, its tip not projecting; maxillary scarcely reaching front of orbit, $2\frac{2}{3}$ in head. Eye moderate, its diameter nearly equaling snout, $\frac{2}{3}$ interorbital width, 4 in head. Teeth 2–4–4–2, with strong hook, and visible grinding surface.

Dorsal fin inserted behind front of ventrals, its origin midway between tip of snout and base of median caudal rays (slightly nearer base of caudal in a younger specimen, a female, with back less elevated). Base of dorsal $\frac{2}{3}$ its height, the longest ray $1\frac{3}{4}$ in head. Base of anal but little shorter than its longest ray, which is $\frac{2}{3}$ length of head. Caudal rather short, less than length of head. Ventrals reaching vent, $1\frac{3}{5}$ in head; pectorals reaching base of ventrals, $1\frac{1}{4}$ in head.

Scales much higher than long, very closely imbricated, becoming very small on nape; about 30 scales before dorsal; lateral line much decurved anteriorly.

Peritoneum bright silvery.

Head 4 in length; depth 2⅔. D. 8, A. II, 10 or 11; Lat. l. 40.

Color olivaceous, everywhere thickly dusted with fine black specks, lighter on belly and below; no dark stripe on back; snout and upper anterior profile dusky; traces of orange red along scales of belly. Fins all jet black, most intense on anterior rays of vertical fins, and on outer rays of paired fins. Caudal paler. Some of the scales along sides still showing fine tubercles, which in life doubtless covered sides of body and top of head.

The specimen serving as type of this description is an adult male, 3 inches long, from Shunganunga Creek. A smaller female specimen is also in the collection from the same locality. This latter is filled with ripe spawn, the depth being 3½ in length. The profile rises in an almost straight line from snout to base of dorsal, and the fins are uniformly pale, with the exception of a dark spot at base of anterior dorsal rays. No trace of this dusky blotch is visible in the male.

Type specimen numbered 36613 on the catalogue of the U. S. National Museum.

INDIANA UNIVERSITY, *September* 26, 1884.

DESCRIPTION OF A NEW RACE OF THE RED-SHOULDERED HAWK FROM FLORIDA.

By ROBERT RIDGWAY.

Buteo lineatus alleni, subsp. nov.

SUBSP. CHAR.—Smaller than *B. lineatus*, the adult much paler in color, with no rufous on upper parts, except on lesser wing-coverts; the young decidedly darker than in true *lineatus*.

Adult male (type, No. 99538, Tampa, Fla., May 20, 1878): Head and neck above brownish ash-gray, the feathers with very distinct blackish shaft-streaks; all the feathers white at the base, this showing, in places, on the occiput, where the feathers are decidedly darker than on the crown; some of the feathers slightly tinged with ochraceous. Back and scapulars ash-gray, each feather with a large terminal spot (occupying most of the exposed portion) of dusky brown; the longer scapulars barred, chiefly on the concealed portion, with white and light grayish. Lesser wing-coverts bright rufous, varied with dusky shaft-streaks; middle and greater wing-coverts brownish gray, transversely spotted and barred with white; secondaries similar, but darker terminally, broadly tipped with white, and crossed by three bands of the same; primaries dusky, the outer webs distinctly spotted with white. Tail brownish black, narrowly tipped with white, and crossed by two narrow

bands of the same, with a third, but much narrower, band hidden by the upper coverts. Sides of head, with chin and throat, dull white, narrowly streaked with gray and fine shaft-lines of black. Lower parts in general barred with white and pale ochrey rufous, in nearly equal proportion, except on the crissum, where the dark bars (dull grayish brown instead of rufous) are sparse, and on the tibiæ, where the rufous bars are much narrower and brighter in color. All the feathers of the foreneck, breast, sides, flanks, and abdomen marked with distinct narrow shaft-lines of dusky. Wing 12.50, tail 7.80, culmen .80, tarsus 3.20, middle toe 1.35.

Young (type, No. 78395, Clear Water, Florida, October 1879; S. T. Walker): Above dusky brown, the feathers with more or less white toward bases, showing as streaks on head and neck, and as occasional irregular spotting on other portions; lesser wing-coverts edged and tipped with dull light ferruginous; anterior scapulars and interscapulars marked, chiefly on concealed portion, with large irregular spots of pale dull ochraceous; wing-coverts much spotted, chiefly beneath the surface, with white; five outer primaries with that portion of the outer web anterior to the emargination dull white, washed with ochraceous, and with a few dusky bars; inner primaries with outer webs spotted with ochraceous. Tail dusky, narrowly tipped with white and crossed by five narrow bands of brownish gray, besides several narrower bands concealed by the upper coverts; these bands narrower toward the base of the tail and also more rufous, especially on lateral feathers. Lower parts buffy white, broadly striped with dusky on throat and foreneck, and marked with irregular, but mostly broadly sagittate or hastate, spots of the same on breast, abdomen, and sides; tibiæ marked with small transverse spots and bars of brown; crissum almost immaculate. Wing 12.75, tail 8.50, culmen .90, tarsus 3.20, middle toe 1.48.

Three adults from the Everglades present the characters of the race or subspecies even more strongly than the type described above. Unfortunately, however, the sex is not indicated. The very decided ashy coloration of the upper parts, relieved only by fine shaft-lines of black on the head and neck, dusky clouding on the back, and white streaking on the occiput, combined with the pale coloration of the lower parts, serves readily to distinguish this race from the true *B. lineatus*.

In "History of North American Birds," vol. iii, p. 277, attention is called to the smaller size of Florida birds of this species, and the darker plumage of the young, as shown by a series of twelve specimens in the Museum of Comparative Zoölogy at Cambridge, Mass. It is unfortunately stated, however, that the plumage of the adults "does not differ appreciably" from that of northern birds—a statement which, as shown by the material now before me, is certainly erroneous.

In naming this very strongly characterized form I take pleasure in dedicating it to Mr. J. A. Allen, of the Museum of Comparative Zoölogy, as a slight token of esteem.

SMITHSONIAN INSTITUTION, *October* 13, 1884.

ON TWO HITHERTO UNNAMED SPARROWS FROM THE COAST OF CALIFORNIA.

By ROBERT RIDGWAY.

The so-called *Passerculus anthinus* of authors (but not of Bonaparte) includes two quite different birds, one of which is a very dark-colored form of *P. sandwichensis*, confined to the *salt* marshes about San Francisco Bay, while the other apparently belongs exclusively to similar localities along the coast south of San Francisco, especially about San Diego and Santa Barbara, but also extending for an undetermined distance to the northward and southward of these localities. So far as we know, the southern limit, during spring or summer, of the last mentioned form is San Quentin Bay, Lower California,* while I have seen no typical examples from north of Santa Barbara. The material in hand is not sufficient to determine the status of the San Diego and Santa Barbara bird, many of the specimens being in winter plumage—a considerable proportion of them evidently young. In these obscurely colored streaked sparrows the greatest care should be taken in forming an opinion as to the relationships of allied forms, since, if immature and winter specimens are placed on an equal footing with adults in perfect plumage, in making comparisons, the real distinctions become confused and the difficulties of the case thereby increased. My own impression, at the present moment, after a careful comparison of the series before me (52 specimens of both forms), is that they both represent specializations of the widely distributed and very "plastic" *P. sandwichensis*. This is almost certainly the case with the more northern form (*bryanti*), but the southern one (*beldingi*) is so very different in its appearance as to convey at once, in the case of spring and summer birds, the impression of a decidedly distinct species. It is not so much this fact, however, as the consideration that Mr. Belding and Mr. Henshaw, both of whom have made an intimate acquaintance with the bird in life, have expressed their decided opinion as to its specific distinctness,† that I here describe it under a binomial title, as—

Passerculus beldingi, sp. nov.

Passerculus anthinus, COOPER, Orn. Cal. I. 1870, 183 (part; spec. ex San Diego).—RIDGW. Nom. N. Am. B. 1881, no. 194 (pt.).—BELDING, Proc. U. S. Nat. Mus. vol. 5, 1883, 528 (San Quentin Bay, Low. Cal.).

Passerculus savanna var. *anthinus*, COUES, Key, 1872, 136 (part); Check List, 1873, no. 159a.—B. B. & R. Hist. N. Am. B. I. 1874, 539 (part).—HENSH. Orn. Wheeler's Exp. 1876, 240 (Santa Barbara, June, July).

Passerculus savanna anthinus, STREETS, Bull. U. S. Nat. Mus. no. 7, 1877, 9 (Todos Santos I., Lower Cal.).

Passerculus sandvicensis anthinus, COUES, 2d Check List, 1882, no. 228 (pt.); 2d Key, 1884, 363 (pt.).

* Dr. T. H. Streets obtained a specimen at Todos Santos Island, near the southern extremity of the peninsula, but no information is given, either on the label or in his paper, as to the date. It seems, however, to be in winter plumage.

† I would add that Mr. Henshaw entertained a contrary opinion before his recent visit to the coast of Southern California, where he collected many specimens.

SP. CHAR.—Similar to the darker form of *P. sandwichensis* (i. e. *bryanti*), but much darker, with decidedly heavier dark spotting on lower parts, the bill larger and more elongated.

Adult male (type No. 96613, San Diego, Cal., March 9, 1884; L. Belding): Above dull grayish olive, heavily streaked with brownish black, the streaks narrowest across nape and on rump; interscapulars with scarcely a trace of lighter edgings, and crown without indication of lighter median stripe; outer webs of tertials and greater wing-coverts tinged with brown, the primaries edged with light olive-green. Supraloral line, extending to above the eye, dull olive-yellow; distinct malar stripe dull buffy white, bordered above by a blackish stripe from rictus along lower edge of cheeks and auriculars, and below by a similar stripe, narrower anteriorly, widening posteriorly; auriculars dull olive grayish, indistinctly streaked with lighter and darker, the upper edge with dusky prevailing, and slightly contrasted with an indistinct postocular stripe of streaked dusky and light olive-grayish. Lower parts white, the whole throat speckled with black, the jugulum, breast, sides, and flanks heavily streaked with black, these streaks averaging nearly .10 of an inch in width; entire abdomen, anal region, and crissum immaculate. Maxilla black, with pale brownish tomium; mandible pale brownish (in skin), darker terminally; tarsi pale brown, toes deep brown. Wing 2.70, tail 2.00, culmen .52, bill from nostril .35, gonys .31, tarsus .80, middle toe .60.

Adult female (type, No. 96614, same locality, &c.): Exactly like the male, but with a very slight indication of a median stripe on the crown. Wing 2.55, tail 2.00, culmen .50, bill from nostril .31, gonys .30, tarsus .78, middle toe .59.

Hab.—Salt marshes along the coast of Southern California and Pacific side of Lower California, south to Todos Santos Island, north to at least Santa Barbara.

Passerculus sandwichensis bryanti, subsp. nov.

Passerculus anthinus, BAIRD, B. N. Am. 1858, 445; Cat. N. Am. B. 1859, no. 334 (not of BONAP. 1853*).—COOPER, Orn. Cal. I. 1870, 183, et AUCT. (part).

Passerculus savanna, var. *anthinus*, COUES, Key, 1872, 136 (part).—B. B. & R. Hist. N. Am. B. I. 1874, 539, pl. xxiv, fig. 10, et AUCT.

Passerculus sandvicensis anthinus, COUES, 2d Check List, 1882, no. 228, et AUCT. (part).

* Bonaparte's *P. anthinus* was based upon a specimen from Kodiak, Alaska, from which locality the National Museum has received a considerable number of specimens. Comparing these with Bonaparte's description, it is found that some of them fit sufficiently well to leave no doubt as to what Bonaparte had in hand. We must therefore transfer *anthinus*, Bp., to *alaudinus*, Bp., as a pure synonym, the two names having been based on somewhat different plumages of the same bird. At the same time, we must admit that the authors of "History of North American Birds" were mistaken in supposing (vol. I. p. 539, foot-note) that the localities of the two supposed species as given by Bonaparte—*i. e.* California for *alaudinus* and Kodiak for *anthinus*—had been transposed. In further explanation, it may be stated that while these two supposed species were described in the same number of the "Comptes Rendus" (vol. xxvii, Dec. 1853), *alaudinus* is given on page 918 and *anthinus* on page 919, the former thus having, according to some rulings, priority.

SUBSP. CHAR.—Differing from *P. sandwichensis alaudinus* in decidedly smaller size and much darker coloration of the upper parts, the latter approximating the plumage of the same portions in *P. beldingi*.

Adult male (type, no. 96633, Oakland, Cal., January 23, 1884; W. Bryant): Above grayish brown, somewhat suffused with buffy yellowish, the pileum and back heavily, the nape and rump narrowly, streaked with brownish black; pileum with a quite distinct median stripe of dull buff, broken, however, by black streaks; interscapulars showing quite distinct light grayish brown edgings. A very distinct superciliary stripe of bright olive-yellow, the yellow purer anteriorly; a malar stripe of light buff, extending upward behind the auriculars; auriculars bright brown, inclining to tawny, edged both above and below with black; lower parts white, the throat minutely and sparsely speckled with the same and bounded on each side by a cuneate stripe of blackish; jugulum, breast, and sides distinctly marked with cuneate streaks of brownish black, averaging much less than .10 of an inch in width. Maxilla blackish, with pale brownish tomium; mandible pale brownish (in skin); tarsi and toes nearly uniform pale flax-brown. Wing 2.70, tail 2.00, culmen .45, bill from nostril .30, gonys 29, tarsus .80, middle toe .65.

Adult female (type, no. 96628, same locality and collector, February 14, 1884): Essentially identical in color with the male, but supercilium rather brighter yellow, the malar stripe deeper buff. Wing 2.50, tail 1.95, culmen .45, bill from nostril .29, gonys .28, tarsus .80, middle toe .60.

Hab.—Salt marshes of San Francisco Bay (and perhaps southward along the coast of Southern California in winter).

This form, which has been mixed by authors with *P. beldingi*, under the names of *P. anthinus*, *P. savanna anthinus*, &c., I take pleasure in dedicating to Mr. Walter Bryant, of Oakland, Cal., who has taken the majority of the specimens now existing in collections, and who has devoted much study to the birds of San Francisco Bay and vicinity.

DESCRIPTION OF SEVEN NEW SPECIES OF CRUSTACEA AND ONE WORM FROM ARCTIC ALASKA.*

By JOHN MURDOCH.

The following species were obtained by the Point Barrow expedition, under the command of First Lieut. P. H. Ray, Eighth United States Infantry, acting signal officer.

This expedition was sent out in 1881 by the United States Signal Service to establish one of the stations of the International Polar Conference at Point Barrow, and remained for two years in the Arctic re-

* Published by permission of the Chief Signal Officer, U. S. Army.

gions. Part of the material was obtained near the station, and part at Point Franklin and Norton Sound on the return voyage.

The writer was attached to the expedition as naturalist and observer. The type specimens are in the National Museum at Washington.

CRUSTACEA.

DECAPODA.

1. Pandalus dapifer, n. sp.

Description.—Length of carapace (including rostrum) contained about 2⅔ times in total length. Rostral carina beginning about the middle of the carapace and armed with two or three teeth. Rostrum exceedingly long, nearly 1½ times the length of the carapace, slender and tapering, slightly curved up, with 5–7 teeth on the upper edge, running only about ⅓ of the length of the rostrum, leaving the rest unarmed to the tip. Eyes large, pyriform, and black. Peduncle of antennule reaches about to middle of antennal scale, and its distal segment is about ¼ the length of the preceding. Internal flagellum of antennule slender, reaching nearly to end of rostrum; external about ⅔ as long as internal, much thickened nearly to the tip, where it suddenly becomes slender. Antennal scale a little more than half as long as the rostrum. External maxillipeds long and slender, reaching nearly to the tip of the antennal scale or about to the middle of the rostrum. First pair of legs very slender, reaching to the tips of the outer maxillipeds. Second (chelate) legs unequal: left very long and slender, reaching to the tip of the rostrum; carpus multiarticulate, with about twenty-five joints, of which the distal twenty or so are separated by distinct articulations; right leg much shorter, reaching only to tip of antennal scale, with a carpus of about seven joints only; distal joint of carpus in each leg equal in length to preceding two, the rest about as long as broad. Right chela a little the larger, both alike otherwise, hardly stouter than carpus; digits equal, slightly gaping, and a little shorter than the basal portion. Third, fourth, and fifth pairs of legs long and slender, reaching nearly to the tip of the antennal scale. Abdomen rounded above except the third segment, which is compressed and keeled. This keel is produced into a blunt backward-pointing hook in the male. Sixth segment once and a half as long as the fifth and equal in length to the telson. Telson rounded at the tip and armed with three pairs of spines.

Dredged in abundance off Point Franklin, in 13½ fathoms, August 31, 1883.

Museum No., 7881.

SCHIZOPODA.

2. Mysis rayii, n. sp.

This species belongs to the same division of the genus as *M. vulgaris*, having the telson entire and the antennal scale fringed on both sides with setæ. It may at once be distinguished from *M. vulgaris*, by the shape of the rostrum, which is quadrangular, with rounded corners.

Description.—Rather slender, with the cephalo-thorax a little narrower in front than the rest of the body. Carapace of medium length, exposing only the dorsal portion of the last thoracic segment. Rostrum lamellar, quadrangular, with the antero-lateral angles rounded, about as broad as long, reaching half the length of the ocular peduncles. Eyes not large, hemispherical; peduncles clavate, stout. Peduncle of the antennule about one-third of the length of the carapace, bearing two flagella, about equal to the carapace in length. Antennal scale sharply lanceolate, about as long as the carapace, bearing setæ on both edges, and armed at the tip with a sharp spine. Antennæ about as long as the body. Legs medium, with tarsi of eight or nine joints. Telson about half the length of the cephalo-thorax, lanceolate, channeled deeply above for its whole length, with apex truncated, entire, and fringed with short stout setæ. Uropods long, with the inner lamella as long as the telson, and the outer more than twice as long. Transparent, with a few arborescent black pigment spots. Length, between 60 and 65^{mm}.

Locality, Point Barrow, near the station, in about 5 fathoms. Abundant.

Museum Nos., 7881, 7892.

The species is respectfully dedicated to Lieutenant Ray, who was superintending the dredging at the time it was taken.

AMPHIPODA.

3. **Acanthozone polyacantha**, n. sp.

Description.—Head rounded, with a very short, sharp rostrum and a small lateral spine at the base of the lower antennæ. Eyes round and prominent. Posterior edge of first five segments of pereion raised into a rounded ridge, developing into a median tooth on the fifth segment. Anterior edge of first segment also raised into a similar ridge, curving forward over the head. Last two segments of pereion and first four of pleon armed on the posterior edge with a large broad median tooth pointing backwards, largest on the third segment of the pleon, and very small, almost obsolete on the fourth. The last two segments of the pereion and the first two of the pleon also carry a small accessory tooth midway between the median tooth and the epimeral suture. The epimeral suture bears a deep lateral keel, which becomes a sharp, posterior, backward-pointing tooth on the last two segments of the pereion and the first four of the pleon. The infero-posterior angle of the epimeron bears a spine (there are two on the second segment of the pleon). Upper antennæ about two-thirds the length of the lower. Gnathopods slender, subchelate. Telson rather long, entire.

Locality, Point Franklin, 13½ fathoms, August 31, 1883. Scarce.

Museum No., 7898.

4. **Melita formosa**, n. sp.

This species is very close to *M. obtusata*, but may be distinguished by the shape of the nail of the second gnathopods.

Description.—Antennules with the first joint of the peduncle not quite as long as the second. Two anterior segments of pleon, with infero-posterior angle acute; third segment with this angle acute and produced upwards. Second and third segments of pleon armed with a single tooth, each, on posterior margin, fourth with three, fifth with four teeth, all very small. Hand of first gnathopod oval and fringed with long hairs on the posterior margin. Hand of second gnathopod in male broadly oval, armed on the edge with three to four blunt teeth and running out into a broad blunt tooth; claw large, curved, and *acute*, shutting on the inside of the palm. Inner ramus of the last pair of saltatory feet ovate. Color purple, with a lighter streak down the middle of the dorsal surface.

Locality, beach near the station. Abundant.

Museum Nos., 7893, 7894, 7895.

5. Melita leonis, n. sp.

This species is closely allied to *M. dentata*, but differs in the denticulation of the segments of the pleon, and in the length of the antennules.

Description.—Eyes small, oval, black. Antennules reaching to the first segment of the pleon, with the first joint of the peduncle a little shorter than the second. Third segment of the pleon with infero-posterior angle acute and produced upwards. First and second segments of pleon with one large median tooth on the posterior edge, and eight fine denticulations, the latter larger on the second segment; third with nine teeth, of which the median one is largest; fourth with five; fifth with six, lacking the median tooth; sixth with two small blunt teeth. Hand of first gnathopod oval, shorter than the carpus; claw simple, curved. Second gnathopod with infero-posterior angle of third joint not produced into a tooth; hand elongate-oval, edge not toothed. Color purple with two lighter streaks along the dorsal surface.

Locality, head of Norton Sound, 5 fathoms, September 12, 1883. Abundant.

Museum Nos., 7896, 7897.

Named from the schooner "Leo" of San Francisco, from which vessel the specimens were obtained by dredging.

6. Dulichia arctica, n. sp.

Description.—Head slightly produced, forming an obtuse angle. First epimeron produced into a sharp spine projecting forward, the rest unarmed. Body smooth. Basa of second gnathopods dilated and armed with two teeth; hand large, subtriangular, and armed on the edge with two long stout teeth. Basa of first two pairs of pereiopods produced into stout teeth. Last three pairs of pereiopods not specially long; third joint as long as the fourth and fifth together. Second pair of saltatory feet with outer ramus nearly twice as long as the peduncle; inner a little longer. Eyes small, round, and black. Color, grayish.

Locality, near the station; 5 fathoms, muddy bottom. Not plenty.
Museum Nos., 7899, 7900.

PHYLLOPODA.

7. **Polyartemia hazeni**, n. sp.

Description.—Body long (twice the length of the abdomen) and stout. Legs, generally seventeen pairs; males usually with one pair more than the females. Head in the male prolonged anteriorly into a short, thin lamellar process. Male "claspers" large, stout, broad, and palmate, strongly incurved. From the middle of the lower edge projects a large curved process armed on the tip and inner surface with numerous fine teeth. The extremity of the "clasper" is bifurcated into two short blunt branches, also armed on the inner side with fine teeth. Feet short and broad. Caudal appendages small and slender, a little longer than the last abdominal segment. Ovisac voluminous, nearly as long as the abdomen; end rounded, with a short, tooth like process on each side. Color, when living, a pale iridescent green.

Locality, fresh-water pools on the tundra near the station; summer. Abundant.

Museum Nos., 7929, 7930, 7931.

Respectfully dedicated to General W. B. Hazen, Chief Signal Officer, United States Army.

VERMES.

TELETHUSEÆ.

8. **Arenicola glacialis**, n. sp.

This species is closely allied to *Arenicola marina*, but has only six setigerous segments anterior to the gills, and eleven gill-bearing segments, instead of seven and thirteen as in *A. marina*.

These numbers are constant in the five specimens obtained. The six abranchiate segments are each composed of five distinct annulations, and each bear a pair of simple tubercular feet. The dorsal setæ are all of one kind, about eighteen in number, slender and slightly serrulate, the longest longer than the foot. The ventral setæ are thirty-five to forty in number, and form a single row on each side of the ventral surface of the ring. They are short, slender, and simple, and barely project above the surface of the skin. The branchiate segments are each composed of six annulations. Each branchia consists of one cluster of about fifty simple cirri, annulated in contraction. The branchiæ increase in size from the first to the ninth pair; the tenth and eleventh pairs are slightly smaller. The feet are small and tubercular; the dorsal setæ, seven, similar to those of the abranchiate segments, but only about two-thirds of their length. The ventral setæ are the same as in the abranchiate segments.

The caudal portion is about one-third of the length of the animal, without tubercles or other appendages. Color in alcohol, blackish gray, lighter on the ventral surface.

Locality, beach near the station after a fresh westerly gale.

Museum Nos., 851, 854.

SMITHSONIAN INSTITUTION, *November* 1, 1884.

NEW OR SPECIALLY INTERESTING SHELLS OF THE POINT BARROW EXPEDITION.

By W. H. DALL.

There being a doubt as to the time of publication of the Point Barrow report as a whole, it was thought best, with the permission of Lieut. P. H. Ray, acting signal officer, to publish a note on the new or more remarkable forms, in order that the interesting results of the exertions of Lieutenant Ray and party should not grow stale or be rendered obsolete by later researches.

CEPHALOPODA.

Octopus grönlandicus (Dew.) Mörch.

A fine specimen from Point Barrow, quite distinct from the *O. punctatus*, which is abundant to the southward.

PULMONATA.

Cochlicopa lubrica (Mull.) Jeffr.

Zonites (Conulus) stearnsii Bland.

Hyalina arctica Lehnert, Science Record, June, 1884.

Zonites (Hyalina) radiatula Alder.

Hyalina pellucida Lehnert, l. c.

The above three species from moss off the tundra near Point Barrow.

MARINE GASTROPODA.

Bela harpa n. s.

Shell fusiform, moderately thin, six whorled; whorls rounded, suture distinct; sculpture consisting of (on the last whorl) 23 stout, uniform, slightly flexuous rounded ribs extending from the suture to the canal with slightly narrower interspaces; lines of increase distinct; sometimes threadlike; these are crossed by numerous close-set spiral threads, separated by narrow grooves, both faint near the suture; threads growing stronger, regularly wider, and coarser gradually toward the canal, near which they are stronger than the obsolete ends of the transverse ribs; anal fasciole (notch band) indistinct, aperture narrow, elongated with an acute posterior angle, outer lip thin, columella simple, canal rather wide; shell whitish, with a reddish tinge anteriorly, especially on the last whorl; interior of aperture reddish, of the canal pure white. Longitude of shell, 17.0; of last whorl, 12.5; of aperture, 10.0^{mm}. Latitude of shell, 8.0; of aperture, 3.5^{mm}.

First found by Dall at Nunivak Island, in 1874. One specimen dredged by the Point Barrow expedition in 13½ fathoms, 10 miles west of Point Franklin, Arctic Ocean. Museum No. 40959.

This species has been compared with the Belas in the chief museums and private collections of Northern Europe, and seems amply distinct from any of the species contained in them.

Bela murdochiana n. s. Plate ii, fig. 8.

Shell whitish, short, stout, with rather coarse sculpture and very short spire, whorls about five, the last much the largest; whorls inflated, suture deep, almost channeled, sculpture of numerous (on the last whorl about two to the millimeter) narrow, backwardly convex, flexuous riblets with about equal interspaces, strongest near the suture, not crossing the fasciole and obsolete near the periphery; lines of growth distinct, crossed by numerous (about six to the millimeter) rather coarse threads, of which each alternate one tends to be smaller, separated by narrow grooves and about uniformly distributed over the surface, with a tendency to a faint carina in front of the indistinct fasciole*; outer lip sharp, columella simple, white; aperture pinkish, canal short, wide; nuclear whorls eroded in the specimens; operculum light horn color, rather broad and short; soft parts pink. Longitude of shell, 11.5; of last whorl, 10.0; maximum latitude of shell, 8.5mm. Museum No. 40960.

Specimens were obtained from Cape Smythe in 2 to 5 fathoms mud and sand with young *B. tenuilirata*, from which they differ in lighter color of shell, coarser sculpture, and stouter proportions. The operculum of *B. tenuilirata* is black, narrow, and claw-shaped.

The species is dedicated to Mr. John Murdoch, naturalist to the Point Barrow party.

Admete Middendorffiana Dall.

Admete viridula, Midd. Mal. Ross. ii, plate ix, figs. 13, 14, 1849, *not of* Fabricius.

This form is perfectly distinct from *A. viridula*, and may prove to be a *Cancellaria*. It is one of the characteristic forms of the Pacific arctic and ranges north from Nunivak Island. The present specimen was obtained in 5 fathoms mud, in Norton Sound. Museum No. 40961.

Chrysodomus Kroyeri Moller var. **Rayana** Dall.

A specimen of *C. Kroyeri*, in the state called *cretaceus* by Reeve, was found on the beach at Cape Smythe; a very large living specimen of the

* It now being certain that the notch in the *Pleurotomidæ* is for the purpose of allowing the effete matters to escape from the anus without fouling the water going to the gills, the term *anal fasciole* is here proposed for the band marking the track of the notch which in *Pleurotoma* and its allies, in *Pleurotomaria*, *Scissurella*, *Rimula* and its relatives, &c., forms a conspicuous feature in the sculpture, for which, hitherto, there has been no convenient term for use in description. The *siphonal fasciole*, named by Prof. Theodore Gill, bears a somewhat similar relation to the anterior end of the canal, but is generally less distinctly marked off from the rest of the surface. For the notch itself the term *anal notch* may be used, to distinguish it from the *siphonal notch*, in description.

normal form was dredged near the same place in 5 fathoms; some with few ribs in 2½ fathoms.

This shell when fresh and perfect is of a plum color, or dull purple, with fine spiral striæ, recalling those of *Buccinum tenue*, and strong transverse ribs. The dead and weathered form is nearly white. This is Reeve's *Fusus cretaceus*. The variety *Rayana* has no ribs, but is perfectly smooth except for the fine sculpture which enables its relations to be recognized. It would be taken as a distinct species at first sight. It was dredged at Cape Smythe, and is named in honor of Lieut. P. H. Ray, U. S. A., the commander of the expedition. Museum No. 40972.

Chrysodomus Martensi Krause.

This fine new species was found on the beach near the station. Museum No. 40976.

Strombella malleata n. s.

This shell, which comes nearest to *S. beringii* (Midd.) Dall, is long and slender, the young shell forming several whorls in an almost cylindrical coil before they begin to enlarge. The adult may reach 6 inches in length. The surface is covered with fine spiral striæ and a thin brown epidermis. It differs from *S. beringii* in its dark purple color, its few large (generally only five) transverse ribs, between which the space is nearly flat rather than concave, and a sharp carina on the anterior periphery of the last whorl, on which the suture is laid. The nucleus is large and blunt, the canal short, the form of the mouth variable in different stages and specimens; the outer lip is thin, the aperture dark purple within; the last whorl less than half the length of the shell in most cases. It is generally rude and more or less worn, even when living, the cylindrical tip usually broken off, but the polygonal horizontal section of the whorls is very characteristic.

The writer has collected this species at Port Clarence, Cape Lisburne, Point Lay, Icy Cape, and various other localities within the Arctic basin during the last twelve years. One specimen (Museum No. 40979) was found on the beach near Point Barrow.

Trichotropis (Iphinoe) arctica (Midd.) Dall.

Cancellaria arctica Midd. Mal. Ross. ii, p. 112, plate ix, figs. 11, 12, 15, 1849.

Point Barrow, also Norton Sound. It was originally brought from Bering Strait by Wossnessensky.

Amauropsis purpurea Dall.

With *N. clausa*, but less common, all over the American coast north from Norton Sound. This is *A. helicoides* Midd., not Johnston.

Margarita vorticifera Dall.

One specimen from beach near Point Barrow. This is much farther north than the species was previously known to range.

Patella (Helcioniscus) exarata (Nutt.) Reeve.

A single specimen of this well known Hawaiian species was found on the beach near Point Barrow, having doubtless been thrown overboard by some whaler with ballast. The fact of its occurrence is interesting as illustrating accidents of distribution like Mr. Lord's living *Orthalicus undatus* from Vancouver Island.

Cylichna propinqua M. Sars.

Abundant in 2 to 5 fathoms off Cape Smythe.

ACEPHALA.

Cryptodon sericatus Cpr.

At Cape Smythe and off Point Franklin.

Astarte (Rictocyma) esquimalti (Baird) Dall.

Crassatella esquimalti Baird.
Rictocyma mirabilis Dall.

Two specimens off Cape Franklin in 13 fathoms.

This completes the list of especially interesting forms. The total number found was sixty-one species or varieties, which will be fully enumerated and reported upon in the general report upon the results of the Point Barrow expedition, under the auspices of the United States Signal Service.

JULY 8, 1884.

DESCRIPTION OF A NEW SPECIES OF HYBOPSIS (HYBOPSIS MONTANUS).

By SETH E. MEEK.

Hybopsis montanus sp. nov. (36882.)

Head, $3\frac{2}{3}$; depth, 5; dorsal rays, 8; anal, 6; scales, 4–37–4; body elongated, slender, little compressed; eye rather high up, moderate, $3\frac{3}{4}$ in head; snout blunt, rather long, $3\frac{1}{6}$ in head; margin of upper lip on level of lower margin of eye; mouth rather large, somewhat inferior, lower jaw included, much shorter than upper, end of maxillary reaching slightly past vertical from front of eye; a long barbel at its posterior extremity; length of maxillary (without barbel) 3 in head.

Origin of dorsal slightly nearer base of caudal than tip of snout, tips of anterior rays of dorsal extending past tips of posterior ones when the fin is deflected. Length of longest dorsal ray $1\frac{1}{4}$ in head, and about twice as long as base of fin. Scales in front of dorsal about 14. Origin of dorsal above origin of ventrals; tips of pectorals scarcely reaching ventrals; tips of ventrals reaching to vent. Pectorals, $1\frac{2}{3}$ in head: ventrals, $2\frac{1}{4}$ in head; longest anal ray, 2 in head; length of its base, 3 in head; caudal forked, its inner rays half the length of outer ones, lower lobe longer and narrower than upper. Teeth 4, 4, little hooked,

and without grinding surface. Color brownish, without conspicuous spots; sides and lower part of head silvery.

This species is described from three specimens, each about 2½ inches in length, from the Upper Missouri region, collected by Dr. F. V. Hayden. This species is allied to *H. hyostomus* Gilbert, and *H. æstivalis* Girard. The former has a more projecting snout, the latter a smaller eye, and both are profusely speckled with black dots.

CONTRIBUTIONS TO THE HISTORY OF THE COMMANDER ISLANDS.

No. 4.

A. NOTES UPON THE PLANTS COLLECTED ON THE COMMANDER ISLANDS (BERING AND COPPER ISLANDS) BY LEONHARD STEJNEGER.

By ASA GRAY.

The collection of phanerogamous plants, although not numerous in species, is full of interest.

The *Ranunculaceæ* are *Anemone Richardsoni*, *A. narcissiflora*, *Ranunculus Eschscholtzii*, *R. auricomus* (which, at least, in the var. *cassulicus*, has been found in Kamtschatka), and a form probably of *R. repens*, *Caltha palustris*, *Coptis trifolia*, and *Delphinium elatum*.

The *Cruciferæ* are of small interest, a dwarf *Nasturtium palustre*, *Barbarea vulgaris*, *Arabis Gerardi*, var. *borealis* of Regel, *Cardamine hirsuta* and *C. pratensis*, *Draba incana*, and a small species which may be *D. alpina*. *Viola mirabilis* var. *Langsdorffii* of Regel, and *V. biflora* of Regel are all of that order.

Of *Caryophyllaceæ* there are *Silene acaulis*, *Lychnis apetala*, *Arenaria peploides*, *A. lateriflora*, and *A. macrocarpa*, the remarkable *Stellaria radians*, and the anomalous form of *S. humifusa*, called var. *oblongifolia* by Ledebour, with long and lax stems, elongated internodes, and a habit quite unlike the ordinary form of the species; also the forms of *Cerastium alpinum*, which are common in that region.

Claytonia sibirica and *C. arctica* represent the *Portulaceæ*, and *Geranium erianthum* represents its order.

It is rather remarkable that there is only one leguminous plant in the collection, namely, the widespread *Lathyrus maritimus*.

The *Rosaceæ* are *Spiræa kamtschatica*, *Geum calthifolium*, *G. Rossii*, and a dwarf *G. macrophyllum*, *Sibbaldia procumbens*, *Potentilla fragiformis*, var. *villosa* of Regel and Tilng, and the ubiquitous *P. Anserina* and *P. palustris*, *Rubus stellatus*, and *R. Chamæmorus*, and a small-leaved *Pyrus sambucifolia*.

Saxifragæ are rather numerous: A dwarf *S. Hirculus*, and a still smaller one, which seems to be *S. chrysantha*, Gray; *S. bronchialis*, *S. unalaschensis* of Sternberg (which is *S. flabellifolia* and near to *S. Dahurica*, which we seem not to possess, the North American plant, so called,

being *S. Lyalli* of Engler): *S. bracteata*, peculiar to the region, and *S. punctata*, partly in a form approaching the var. *nana* of the Point Barrow collection. *Chrysosplenium alternifolium*, *Parnassia palustris*, and a little *Drosera rotundifolia* were also collected.

Epilobium latifolium, *E. roseum*, and apparently *E. affine* of Bongard, *Ligusticum Scoticum* and *Selinum Benthami* of Watson, unhappily not in fruit, and *Cornus Suecica* finish the *Polypetalæ*, and *Linnæa borealis* was also collected.

The *Compositæ* are *Aster peregrinus* of Pursh, *Achillea multiflora*, *Chrysanthemum arcticum*, *Matricaria discoidea*, *Artemisia Richardsoniana*, *A. norvegica*, and *A. vulgaris*, var. *Tilesii*, *Arnica unalaschensis*, *Saussurea alpina*, *Picris hieracioides* var. *Japonica*, *Hieracium triste*, and a large form of *Taraxacum officinale* var. *lividum*.

Campanula lasiocarpa was collected in fine state.

Ericaceæ are more largely represented by *Vaccinium oxycoccus* and a form of *V. ovalifolium* (var. *Chamissonis* of Bongard), *Arctostaphylos alpina*, *Cassiope lycopodioides*, and a single scanty specimen of a very marked new species, most related to *C. Stelleriana*, which in foliage is so much like *Vaccinium vitis Idæa* or *oxycoccus* that it is named *C. oxycoccoides*; also *Loiseleuria procumbens*, *Bryanthus* (*Phyllodoce*) *taxifolius*, and *B. aleuticus*, and, best of all, the original *Bryanthus Gmelini* of Don., which we had never before seen. It was known to occur on Bering Island, and it is a great satisfaction that Mr. Stejneger detected it. A view of the flowers certainly weakens the strength of my conviction (acted upon in the Synoptical Flora of North America) that *Phyllodoce* should be referred to the same genus. But a consideration of the parallel differences offered by the corolla of *Cassiope* inclines me still to maintain the view which I had ventured to take. The other *Ericaceæ* are *Ledum palustre*, *Kalmia glauca*, *Rhododendron kamtschaticum*, *R. chrysanthemum*, and *Pyrola minor*. We may here append *Diapensia lapponica*, which occurs in the sparsely-leaved form, named by Maximowicz, var. *asiatica*.

The remaining *Gamopetalæ* are *Trientalis europæa* var. *arctica*, *Primula cuneifolia*, *Gentiana glauca*, and the still rarer *G. auriculata*, *Polemonium cæruleum* and its var. *acutiflorum*, *Mertensia maritima* in a very large form, the rare and local *Veronica kamtschatica* and *V. Stelleri*, as well as the widespread *V. serpyllifolia* and *V. americana*, *Pedicularis Chamissonis*, *Gymnandra Gmelini*, and *Plantago major* var. *asiatica*.

The *Apetalæ* include a very large-leaved and robust *Polygonum viviparum*, *Rumex arcticus*, *Betula nana*, and the following willows, which have been determined by Mr. Bebb, viz., *Salix speciosa*, Hook & Arn., single specimen with male catkin, and several forms of *S. crassijulis*, Trev., which Anderson has combined under the name of *S. Pallasii*.

The Monocotyledons are *Fritillaria Kamtschatkensis*, *Majanthemum bifolium*, var. *Kamtschaticum*, *Veratrum album*, *Tofjeidia calyculata*, *Iris setosa*, *Orchis aristata*, *Habenaria borealis*, *Luzula campestris*, and *L. spa-*

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dicea, var. *parviflora*; and of *Glumaceæ*, *Carex gynocrates*, *C. stylosa*, *C. podocarpa*, *C. Gmelini*, and *C. cryptocarpa*, with *Eriophorum polystachyum*. *Alopecurus alpinus*, *Phleum alpinum*. *Festuca rubra*, *Poa glumaris*, *P. cæsia*, and *Hierochloa borealis*.

The higher Cryptogams are few: *Lycopodium annotinum*, *Botrychium lunaria*, *Aspidium Lonchitis*, *A. aculeatum*, too young for certain determination, *Phegopteris polypodioides* in the same condition, *Equisetum hyemale*, and *E. arvense*.

The Mosses collected it is not in our way to name.

B. Additional notes on the plants of the Commander Islands.

By LEONHARD STEJNEGER.

A few remarks concerning the vegetation of the Commander Islands will be found in the letter to Professor Baird, forming "No. 1" of these "Contributions" (Pr. U. S. Nat. Mus. VI. 1883, p. 63–69). Unfortunately for my botanical collection, my time was too much occupied by other studies and occupations during the short flowering season. Many more plants, however, than those named in the preceding and the following notes were actually collected, but I had to deplore the total ruin of a large portion on account of the humidity of the climate. My collection would have been still smaller had it not been for the kind zeal of Mr. Nicolai Björkquist, *cand. philos.*, to whom I am greatly indebted for valuable additions to my herbarium from Copper Island.

The names and the sequence of the species adopted in the following list are very nearly those of Dr. J. T. Rothrock's "Sketch of the Flora of Alaska" (Smithsonian Institution Annual Report 1867, p. 433–463), in order to facilitate comparison with the flora of the American islands of the Aleutian chain. The figures following the names refer to the volume and page of Ledebour's "Flora Rossica," the nomenclature of which has been given in parentheses whenever differing from the one here employed.

A few species which were not brought home have been included. They are distinguished by an asterisk in front of the name.

Finally, I wish to express my obligations to our venerable botanical Nestor, Prof. Asa Gray, for his kindness in identifying the specimens and commenting upon them.

RANUNCULACEÆ.

Anemone Richardsonii Hooker.—I, 16. Copper Island, Karabelnij, July 11, 1883. On the mountains, about 400 feet above sea-level. Not common.

Anemone narcissiflora LINN.—I, 18. Common on both islands, in the valleys, and at the foot of the hills. Very luxuriant and conspicuous. In 1883 the first flowers were out on Bering Island on June 11.

Ranunculus Eschscholtzii SCHLECHT.—I, 37. Only found at the Southern Seal Rookery, on Bering Island, on the 21st of August, 1882, a few feet above sea-level and hardly 100 yards from the beach, close to a cold spring and a few patches of snow yet remaining not far off.

Ranunculus auricomus LINN.—I, 38. Bering Island, among the sand-dunes at the mouth of Kamenej River. Not common. First flowers June 11, 1883.

? *Ranunculus repens* LINN.—I, 43. Bering Island. *R. repens* is recorded from Kamtschatka.

Caltha palustris LINN.—I, 48. Bering Island. Along the borders of the rivulets, especially in the lower part of Kamenej valley, in peculiar subarctic forms. Not common. First flowers 1883, on June 6.

Coptis trifolia SALISB.—I, 53. Both islands. Not common. Was found on Bering Island by Steller (Pall., Neue Nord. Beitr. II, p. 300).

Trollius patulus SALISB.—I, 50. A conspicuous and common plant of both islands, especially common and luxuriant in the lower parts of Bering Island. Known from Kamtschatka.

Delphinium elatum LINN.—I, 63. Only observed at the Southern Seal Rookery on Bering Island, August 21, 1882.

* *Aconitum delphinifolium*, DE C.?—Specimens were collected but were afterwards spoiled by moisture. Rather common near the village on Bering Island. Flowers light bluish.

CRUCIFERÆ.

Nasturtium palustre DE C.—I, 112. At Comandore, Bering Island, near the place where Steller wintered and Bering died, August 29, 1882.

Barbarea vulgaris R. PR.—I, 114. Common on Bering Island.

Arabis Gerardi var. *borealis* REGEL.—Bering Island, near the village. First flowers in 1883, on June 11.

Cardamine pratensis LINN.—I, 125. On both islands. Rather rare on Bering Island, more numerous on Copper Island.

Cardamine hirsuta LINN.—I, 127. Copper Island, Karabelnij.

? *Draba alpina* LINN.—I, 146. Small round knots of this plant were found sparingly on the mountains round Karabelnij, Copper Island, at an elevation of about 500 feet.

Draba incana LINN.—I, 152. Common on both islands.

VIOLACEÆ.

Viola mirabilis var. *Langsdorffii* (FISCH.).—I, 250. Rather common on both islands. One of the first spring flowers, the first of which, in 1883, were observed at the "Reef," near the village, Bering Island, on June 4.

Viola biflora LINN.—I, 254. Only seen on Copper Island, where rather common both at the village and at Karabelnij. They were flowering during the latter part of June and beginning of July.—*Viola* sp. Stejneger, Pr. U. S. Nat. Mus., 1883, p. 63.

CARYOPHYLLACEÆ.

Silene acaulis LINN.—I, 303.—On the mountains of Copper Island, especially on the western side.

Lychnis apetala LINN.—(*Melandryum*) I, 326. Only a few specimens were found on Copper Island in the valley behind the village, at an elevation of about 200 feet, July 26, 1883.

Arenaria macrocarpa PURSH.—I, 353. Copper Island, Karabelnij Mountains, 3-500 feet altitude. Found flowering during the first half of July.

Arenaria peploides LINN.—(*Honkeneja*) I, 358. Common around the beaches of both islands.

Arenaria lateriflora LINN.—(*Mœhringia*) I, 371. Bering Island. Rather common.

Stellaria radians LINN.—I, 378. Bering Island. Rather common.

Stellaria media VILL.—I, 377. Bering Island. Common.

Stellaria humifusa var. *oblongifolia* LEDEB.—I, 384. Bering Island. Common.

Cerastium alpinum LINN.—I, 411. Karabelnij, Copper Island.

Cerastium alpinum var. *Fischerianum* (REGEL).—Bering Island. Common.

GERANIACEÆ.

Geranium erianthum DE C.—I, 464. Rather common on both islands.

LEGUMINOSÆ.

Lathyrus maritimus (LINN.) REGEL.—(*Pisum*) I, 661. Common on both islands near the beach.

ROSACEÆ.

Spiræa kamtschatica PALL.—II, 19. Bering Island. In some places very numerous and very exuberant—for instance, at Schipitzina, near the southwestern extremity, and in the valley of Stare-Gavan.—Recorded already by Steller, Neue Nord. Beitr. II, p. 301.

Geum calthifolium SMITH.—Common on both islands, a few specimens even ascending an elevation of 1,200 feet.

Geum calthifolium var. *rotundifolium* (BONG.).—(*Sieversia rotundifolia*) II, p. 24. Copper Island.

Geum Rossii (R. BR.) DE C.—(*Sieversia*) II, 25. Found at the new graveyard, Bering Island, and at Karabelnij, Copper Island, but nowhere numerous. The first flowers were seen in the former locality on June 5, 1883.

Geum macrophyllum WILLD.—II, 22. Both islands, but not numerous.

Sibbaldia procumbens LINN.—II, 32. Found only in a single locality on Copper Island, viz., in the Bobrovaja valley, at an elevation of about 300 feet, August 2, 1883.

Potentilla Anserina LINN.—II, 44. Common on both islands. From the beach up to 7–800 feet on the mountains.

Potentilla fragiformis var. *villosa* REG.—II, 58. Common on both islands.

Potentilla palustris (LINN.) SCOP.—(*Comarum*) II, 62. Common in swampy places on both islands.

Rubus stellatus SMITH.—II, 71. Common on both islands, up to 500 feet. The first flowering plants were noted on July 7, 1883, at Karabelnij, Copper Island. Delicious, ripe berries were found at Bujan, eastern shore of Bering Island, August 30, 1882. The *Rubus arcticus* reported by Steller from Bering Island is probably this species (N. Nord. Beitr. II, p. 300).

Rubus Chamæmorus LINN.—II, 71. On both islands, but only on Bering Island in any number. "Maroschka" of the natives.—Steller: "gelbe Brombeeren (Chamæmorus)" (*l. c.*).

* *Rosa cinnamomea* LINN.—II, 76. Sparingly on Bering Island. It is found on the road between Stare-Gavan and the village.—"Wilde Rosen," Steller, *l. c.*

Pyrus sambucifolia CHAM. & SCHLECHT. var. ?—II, 99. On both islands; rather common. Very dwarfed, hardly ever over 3–4 feet high. First flowers July 11, 1883, on Copper Island.—*Sorbus aucuparia* Steller, N. Nord. Beitr. II, p. 300.

ONAGARIÆ.

Epilobium latifolium LINN.—II, 106. Collected at Bujan, Bering Island, August 30, 1882.

Epilobium roseum SCHREB.—II, 110. Bering Island. Common.

? *Epilobium affine* BONGARD.—II, 110. Bering Island. Originally described from Sitka; apparently not known from elsewhere.

PORTULACEÆ.

Claytonia sibirica LINN.—II, 149. Common in all low and swampy places on both islands.

Claytonia arctica ADAMS.—II, 148. Copper Island, mountainous slopes at Karabelnij. Originally described from the mouth of Lena, and has since been found on St. Paul's Island, Kiska, &c. Color of corolla white, with beautiful orange-yellow at the base of the petals.

SAXIFRAGACEÆ.

Saxifraga Hirculus LINN. ("running to *chrysantha*, GRAY").—II, 210. Copper Island, Karabelnij.

Saxifraga chrysantha GRAY.—Copper Island. Collected in the valley behind the village, at an altitude of about 700 feet.

Saxifraga bronchialis LINN.—II, 207. Copper Island. Same locality as foregoing.

Saxifraga unalaschensis STERNB. (*S. flabellifolia*, R. BROWN).—II, 213. Copper Island, steep slopes of Karabelnij Mountains, 300 feet and higher; not numerous. Flowering during first part of July.

Saxifraga bracteata DON.—II, 219. Collected on both islands; at Bering Island near the village; on Copper Island at Glinka; in both cases not far from the beach. First flowers noted on the former place June 17, 1883.

Saxifraga punctata LINN.—II, 215. Common on both islands. The form "nearly var. *nana* GRAY" (Proc. Am. Acad., xx, 12) was also collected on both islands, at Schipitzina, Bering Island, and at the village, Copper Island.

Chrysosplenium alternifolium LINN.—II, 226. Copper Island, near the village. Several small specimens are marked with a query.

Parnassia palustris LINN.—I, 262. Common on both islands.

DROSERACEÆ.

Drosera rotundifolia LINN.—I, 261. Only seen in the low valley between Bobrovaja and Pestschanij, Copper Island, where I found it rather abundant August 2, 1883.

UMBELLIFERÆ.

Ligusticum scoticum LINN.—II, 286. Bering Island. Common.

Selinum Benthami WATS.—Index, 432. Bering Island. Common.

* *Archangelica officinalis* HOFFM.—II, 297. Both islands.

CORNEÆ.

Cornus suecica LINN.—II, 377. Both islands, but not particularly common. The first flowers in 1883 were found at "Reef," near the village, Bering Island, on June 17. *Cornus herbacea* Steller, N. Nord. Beitr. II, p. 300.

CAPRIFOLIACEÆ.

Linnæa borealis LINN.—II, 392. On the tundra between the *Empetrum*. Bering Island. Rather common.

COMPOSITÆ.

Aster peregrinus PURSH.—II, 473. Rather common on both islands. First flowers noted at Karabelnij, Copper Island, 1883, on August 2.

Achillea multiflora HOOK.—The only place where this species was collected was at Bujan, on the eastern shore of Bering Island, August 30, 1882.

Chrysanthemum arcticum LINN.—II, 541. Common on the rocks of the coast of both islands.

Matricaria discoidea DEC.—II, 544. A very common weed in the streets of the village on Bering Island.

Artemisia Richardsoniana HOOK. var.—Only collected at Saranna, Bering Island, on August 31, 1882.

Artemisia norvegica FRIES.—Bering Island.

Artemisia vulgaris var. *Tilesii* LEDEB.—II, 586. Bering Island. In certain localities very luxuriant.

Arnica unalaschcensis LESS.—II, 623. Both islands. Rather common in certain localities near the shore.

Saussurea alpina DEC.—II, 669. Both islands; rather common.

Picris hieracioides var. *japonica* (THUNB.)—II, 800. Collected at Schipitzina, Bering Island, August 25, 1882, where it obtained a height of 3–4 feet.

Hieracium triste WILD.—II, 853. Bering Island.

Taraxacum officinale var. *lividum* KOCH.—Copper Island; not common.

CAMPANULACEÆ.

Campanula lasiocarpa CHAM.—II, 890. Both islands, but not common First flowers noted at the village, Copper Island, on August 8, 1883.

ERICACEÆ.

Vaccinium oxycoccos LINN.—(*Oxycoccos vulgaris*) II, 905. Only collected in the Bobrovaja valley, northern part of Copper Island, where it was by no means common, but occurs also on Bering Island.

Vaccinium ovalifolium var. *Chamissonis* (BONG.).—II, 903. Mountain slopes of both islands up to 150 feet altitude. Average height about 18 inches.

Arctostaphylos alpina (LINN.) SPRENG.—II, 908. Bering Island, common. First flowers noted on June 7, 1883.

Cassiope lycopodioides (PALL.) DON.—II, 912. Common on both islands up to 500 feet altitude and more.

Cassiope oxycoccoides ASA GRAY, n. sp.*

This new species was found in a single specimen on the same spot where the rare *Bryanthus Gmelini* was collected, and at the same date.

Loiseleuria procumbens (LINN.) DESV.—II, 917. Common on both islands. On Bering Island the first flowers in 1883 were found on May 19.

* "Species to be associated with *C. Stelleriana* with the habit of *Loiseleuria* or of a depauperate *Vaccinium vitis Idæa*; leaves (2 or 3 lines long) elliptical, short-petioled, coriaceous, with margins revolute and the costa prominent underneath: peduncle terminal, short, 4-bracteate, and 3-flowered at the apex; pedicels very short; flowers 5-merous; corolla about twice the length of the calyx, somewhat urceolate-campanulate, the orifice barely 5-lobed."—A. GRAY, MSS.

Bryanthus (Phyllodoce) taxifolius (PALL.) GRAY.—II, 916. Copper Island. Mountain slopes 200 feet and above. Common. Corolla light rose or deep reddish purple.

Bryanthus (Phyllodoce) aleuticus (SPRENG.) GRAY.—Karabelnij, Copper Island. Same localities as foregoing, but seems to go higher up on the sides of the mountains. Corolla yellowish.

Bryanthus Gmelini DON.—II, 916. "Planta rarissima!" I found this interesting species only in a single place on Bering Island, although it probably is distributed over the island. The spot where I collected it is a rounded hill, about 300 feet high, just behind the fishing settlement of Saranna, at the northern shore of the island. The hill rises up from the shore of Lake Saranna, and is the first one when following the track of the dog sledges to the main village. It was by no means uncommon in that locality, and was flowering on the date I found it, the 22d of August, 1882.

Rhododendron chrysanthum PALL.—II, 920. Common on both islands. In 1883 the first flowers were noted on June 5; last ones were observed on August 2.—*Chamærodendros laurifolio, flore flavo.* Steller, *l. c.*—Stejneger, Pr. U. S. Nat. Mus., 1883, p. 63.

Rhododendron kamtschaticum PALL.—II, 922. On both islands above 100 feet altitude, but not so common as the foregoing. In 1883 the first flowers were noted on July 31.—Stejneger, Pr. U. S. Nat. Mus., 1883, p. 63.

Kalmia glauca AIT.—II, 922. Both islands.

Ledum palustre LINN.—II, 923. Both islands.

Pyrola minor LINN.—II, 930. Both islands, rather sparingly.

DIAPENSIACEÆ.

Diapensia lapponica var. *asiatica* MAXIM.—Latter part of June and beginning of July at Karabelnij, Copper Island; dry mountain slopes 200 feet and above.

PRIMULACEÆ.

Trientalis europæa var. *arctica* (FISH.).—III, 24. Both islands.

Primula cuneifolia LEDEB.—III, 15. Very common on both islands, the white flowers rather rare. Up to 1,000 feet altitude. First flowers in 1883 noted on June 5.

GENTIANACEÆ.

Gentiana glauca PALL.—III, 66. Bering Island, near the shore, at the village. Corolla light violet blue, seldom white, with a yellowish tinge.

Gentiana auriculata PALL.—III, 55. Bering Island, rather common. On the mountain plateaus up to 400 feet.

POLEMONIACEÆ.

Polemonium cæruleum LINN.—Common on both islands and luxuriant in certain low and sheltered places.

Polemonium cæruleum var. *acutiflorum* WILLD.—III, 84. Copper Island.

BORRAGINACEÆ.

Mertensia maritima (LINN.) DON.—Common on both islands. In some places extremely luxuriant, a single plant covering a large area. First flowers noted, 1883, Copper Island, July 9.

SCROPHULARIACEÆ.

Veronica kamtschatica LINN. *fil.*—(*V. aphylla*) III, 245. Copper Island, near the village. Low and moist places. Corolla purplish deep blue. June 28, 1883.

Veronica Stelleri PALL.—III, 247. Copper Island. Rather common on the mountain slopes, between 100 to 800 feet; at the latter elevation greatly reduced in size. Collected both at Karabelnij and at the village. July 1–August 6, 1883. Corolla deep purplish blue.

Veronica serpyllifolia LINN.—III, 248. Copper Island, borders of Pestschanij Lake. August 2, 1883.

Veronica americana SCHW.—Bering Island, Sukhaja Reschka, not far from its mouth, into Gavanskij Oser, a few miles east of the village.

Pedicularis Chamissonis STEV.—III, 275. Common on both islands.

SELAGINACEÆ.

Gymnandra Gmelini CHAM. and SCHL.—III, 332. Common on both islands. Noted from Bering Island by Steller.

PLANTAGINACEÆ.

Plantago major var. *asiatica* (LINN.).—III, 479. Bering Island. Not common.

POLYGONACEÆ.

Polygonum viviparum LINN.—III, 519. Common on both islands. Noted by Steller.

Rumex arcticus TRAUTV. ?—III, 506. Bering Island, sparingly on the swampy tundra.

Oxyria digyna CAMPD.—Bering Island, near the Southern Seal Rookery. Also found at Karabelnij, Copper Island.

BETULACEÆ.

Betula nana LINN.—III, 653. Common on both islands.

**Betula Ermani* CHAM.—III, 653. Bering Island, where it grows in the interior of the valleys in dwarfed thickets; the stems often having a length of 8–10 feet, but then bent along the ground, and a diameter at the root of 2–3 inches.

URTICACEÆ.

**Urtica dioica* LINN.—III, 637. Bering Island. Only seen in a single spot a little behind the village, just below the poles on which the large salmon nets are hung up to be dried.

EMPETRACEÆ.

**Empetrum nigrum* LINN.—III, 555. Very common on both islands. Steller, N. Nord. Beitr, II, p. 300.

SALICACEÆ.

Salix speciosa HOOK and AM.—III, 625.

Salix Pallasii, ANDERS.—Bering Island, common.

LILIACEÆ.

Fritillaria Camtschatcensis (LINN.) GAULER.—IV, 147. The saranna-lily is common on both islands, the bulbs being gathered by the natives for food.—"Kamtschatkische braune Lilie," Steller, N. Nord. Beitr., II, p. 301.—*Fritillaria saranna* Stejneger, Naturen, 1882, and Pr. U. S. Nat. Mus., VI, 1883, p. 63.

Veratrum album LINN.—IV, 208. Both islands, especially on Bering Island, where it is common and very luxuriant in damp, sheltered places, not higher than 50 feet above sea-level.

Tofeldia calyculata (LINN.) WAHLENB.—Mountains of both islands, between 200–500 feet altitude, but not very common. Flowering during August.

SMILACEÆ.

Majanthemum bifolium var. *Kamtschaticum* (GMEL.).—(*Smilacina bifolia β Kamtschatica*) IV, 127. Both islands, but not common.

IRIDEÆ.

Iris setosa PALL.—IV, 96. Common on both islands. In 1883, on Copper Island, the first flowers were noted July 25th. *Iris sibirica* Stejneger, Naturen, 1882 (*nec* LINN.).

ORCHIDACEÆ.

Orchis aristata FISCH.—(*O. latifolia γ beeringiana*) IV, 54. Both islands, up to 200 feet altitude. In 1883, on Bering Island the first flowers were noted June 18th.

Habenaria borealis CHAM.—Common in damp places on both islands. The two forms *albiflora* and *viridiflora* both occur.

JUNCACEÆ.

Luzula campestris (LINN.) DEC.—IV, 219. Bering Island.

Luzula spadicea var. *parviflora* (DESV.)—IV, 217. Bering Island.

CYPERACEÆ.

Carex gynocrates WORMSK. Karabelnij, Copper Island, at an elevation of about 500 feet.
Carex stylosa MEY.—IV, 305. Bering Island.
Carex podocarpa R. BR.—Bering Island.
Carex Gmelini HOOK.—IV, 288. Bering Island.
Carex cryptocarpa MEY.—IV, 313. Bering Island.
Eriophorum polystachyum LINN.—Both islands.

GRAMINEÆ.

Alopecurus alpinus SM.—IV, 461. Both islands.
Phleum alpinum LINN.—IV, 458. Bering Island.
Festuca rubra LINN.—IV, 352. Bering Island.
Poa glumaris TRIN.—(*Glyceria g.*) IV, 392. Bering Island.
Poa cæsia SM.—IV, 374. Bering Island.
Hierochloa borealis R. and SCHULT.—IV, 407. Bering Island.

EQUISETACEÆ.

Equisetum hyemale LINN.—IV, 490. Copper Island, Karabelnij.
Equisetum arvense LINN.—IV, 486. Bering Island.

LYCOPODIACEÆ.

Lycopodium annotinum LINN.—IV, 497. Copper Island, Karabelnij. 300 feet altitude.

FILICES.

Botrychium lunaria (LINN.) SWARTZ.—IV, 504. Bering Island. Only seen in one single place just behind the village, where the salmon nets are hung up for drying.

Aspidium Lonchitis (LINN.) SWARTZ.—IV, 512. Copper Island, Karabelnij.

Aspidium aculeatum (LINN.) SWARTZ.—IV, 512. Copper Island. Abundant, 50–200 feet altitude.

Phegopteris polypodioides FÉE.—Copper Island. Mountain slopes of the interior, about 200 feet altitude.

SMITHSONIAN INSTITUTION,
November 20, 1884.

DESCRIPTION OF A NEW SPECIES OF FLOUNDER, CITHARICHTHYS MACROPS, FROM PENSACOLA, FLORIDA.

By H. G. DRESEL, *Ensign U. S. Navy.*

Citharichthys macrops, sp. nov.

The type of this species, No. 21500 in the National Museum collection, is a fine example, 5 inches in length, obtained by Mr. Silas Stearns at Pensacola, Fla.

It somewhat resembles *C. microstomus* Gill, but the mouth is comparatively much larger, the body less elongate, and the scales are different. From *C. spilopterus* Günther, it differs in the greater height of the body, shorter head, larger scales, and much larger eye.

Description.—The body is suboval; the greatest depth being contained not quite 2 times in the total length to caudal base. The upper profile is very convex, descending in a steep curve from the nape to in front of the upper eye, where it forms an abrupt angle with the short, blunt snout. The mouth is moderate, very oblique, and curved. The maxilla reaches to the vertical through the center of the orbit, its length being contained 2½ times in the length of the head, and that of the mandible being about one-half of the length of the head. The teeth are minute, in a single series in the jaws, those of the blind side slightly more developed than the others. The eyes are large, separated by a narrow scaleless ridge, which is curved upward and back to the upper angle of the gill-opening. The upper eye is very close to the profile, slightly longer than the lower, its longitudinal diameter being contained 3½ times in the length of the head, that of the lower eye about 4 times. Their anterior margins are in the same vertical line. The snout is shorter than the eye, its length being one-fifth of that of the head. The gill-rakers are moderate, the longest being about one-half as long as the eye; there are 6 above and 13 below the angle of the anterior arch.

The scales are large, apparently not ciliated. No accessory scales. Each scale is narrowly striated along its middle, and the posterior borders meet in a well-defined obtuse angle, giving a lozenge-shaped appearance to the imbrication. The scales of the pectoral region are somewhat reduced in size. There are 41 scales in the lateral line, 14 transverse rows above and 16 below, at the greatest depth of body; 13 above and 13 below at the middle of the lateral line. The cheek of the blind side has 8 series of scales.

The dorsal fin begins on the blind side near the tip of the snout. The anterior rays are deeply exserted, the first ray being as long as the eye. The fin is highest at its middle portion, the longest ray being slightly longer than one-half the length of the head. The anal origin is below the axis of the pectoral fin, its distance from the tip of the snout being

contained $3\frac{1}{2}$ times in the total length to caudal base. The longest anal ray is slightly longer than the longest dorsal ray. The caudal fin is pointed, the middle caudal ray being one-fourth as long as the total length to caudal base. The pectoral of the eyed side is somewhat longer than that of the blind side, its length being contained $1\frac{2}{3}$ times in that of the head. The ventral of the eyed side is inserted on the ridge of the abdomen; it is shorter than that of the blind side, its length being contained $2\frac{2}{3}$ times in the distance of its origin from the tip of the snout.

The color in spirits is a light olive-brown. The body with some 20 dark brown spots, the largest about as large as the eye. Four of these spots are arranged at equal intervals along the lateral line, the second, near the middle of the latter, being the most prominent. Dorsal and anal fins, with a series of round brown spots, one at the middle of every sixth or seventh ray, besides smaller irregular spots and mottlings. Caudal fin spotted and mottled with dark brown, and with two round brown spots, one above the other, on the basal half of the fin.

Head, 4; depth, 2. Radial formula: D. 80; A. 56. Lateral line, 14–41–16.

A table of measurements of *C. macrops*, *C. microstomus*, and *C. spilopterus* is added for comparison.

Table of measurements.

Species	Citharichthys macrops.		Citharichthys microstomus.		Citharichthys spilopterus.	
Current number of specimen	21500 (type).		36081.		35099.	
Locality	Pensacola, Fla.		Great South Bay, Long Island, N. Y.		Havana, Cuba.	
	millim.	100ths of length.	millim.	100ths of length.	millim.	100ths of length
Length to origin of middle caudal rays	101	.....	88	.....	93	.....
Body:						
Greatest height	52	51.5	41	46.6	40	43
Greatest thickness	6	6	6	7	4	$4\frac{1}{3}$
Height at ventrals	35	35	31	$35\frac{1}{2}$	30	$32\frac{1}{2}$
Least height of tail	13	13	11	$12\frac{1}{2}$	11	12
Head:						
Greatest length	25	25	21	24	27	29
Width of interorbital area	$1\frac{1}{2}$	$1\frac{1}{2}$	1	1.2	1	1.1
Length of snout	5	5	3	3.5	5	5.4
Length of maxilla	10	10	$5\frac{1}{2}$	$6\frac{1}{2}$	11	12
Length of mandible	12	12	$7\frac{1}{2}$	8.5	13	14
Distance from snout to upper orbit	6	6	4	4.6	$5\frac{1}{2}$	6
Diameter of lower eye	$6\frac{1}{2}$	$6\frac{1}{2}$	5	5.7	4	$4\frac{1}{3}$
Diameter of upper eye	7	7	$5\frac{1}{3}$	6.2	$4\frac{1}{2}$	5
Dorsal:						
Distance from snout	4	4	4	4.6	5	5.4
Length of first ray	7	7	$5\frac{1}{2}$	$6\frac{1}{2}$	5	5.4
Length of longest ray	14	14	11	$12\frac{1}{2}$	$12\frac{1}{2}$	13.5
Length of last ray	$2\frac{1}{2}$	$2\frac{1}{2}$	2	$2\frac{1}{3}$	2	2.2
Anal:						
Distance from snout	29	29	25	28.5	31	33.3
Length of first ray	5	5	5	5.7	5	5.4
Length of longest ray	15	15	11	$12\frac{1}{2}$	13	14
Length of last ray	.....	.....	$2\frac{1}{2}$	2.8	$2\frac{1}{2}$	2.7
Caudal:						
Length of middle rays	25	25	17	19.3	*ca*19	21
Length of external rays	14	14	7	8	13	14

Table of measurements—Continued.

Species	Citharichthys macrops.		Citharichthys microstomus.		Citharichthys spilopterus.	
Current number of specimen	21500 (type).		36081.		35099.	
Locality	Pensacola, Fla.		Great South Bay, Long Island, N. Y.		Havana, Cuba.	
	millim.	100ths of length.	millim.	100ths of length.	millim.	100ths of length.
Pectoral:						
Distance from snout	25	25	20	22.8	27½	30
Length { sinistral	16	16	16	18.4	13	14
Length { dextral	12	12	10	11.4	11+	12
Ventral:						
Distance from snout	24	24	20	22.8	25½	27.3
Length on blind side	10	10	10	11.4	8	8.7
Length on eyed side	9	9	9	10.3	7¾	8
Dorsal	80	.....	76	.....	81	.....
Anal	56	.....	57	.....	62	.....
Pectoral { sinistral	11	.....	10	.....	10	.....
Pectoral { dextral	9	.....	9	.....	9	.....
Ventral	6	.....	6	.....	6	.....
Number of scales in lateral line	41	.....	41	.....	46	.....
Number of transverse rows above lateral line	14	.....	10	.....	.....	.....
Number of transverse rows below lateral line	16	.....	14	.....	.....	.....
Number of gill-rakers	6+13	.....	4+6	.....	5+10	.....

NOVEMBER 26, 1884.

DESCRIPTION OF THREE NEW SPECIES OF FISHES (PRIONOTUS STEARNSI, PRIONOTUS OPHRYAS, AND ANTHIAS VIVANUS) COLLECTED AT PENSACOLA, FLORIDA, BY MR. SILAS STEARNS.

By DAVID S. JORDAN and JOSEPH SWAIN.

Prionotus stearnsi, sp. nov. (No. 36943.)

Head $2\frac{2}{3}$ in length ($3\frac{1}{3}$ including caudal); depth 4 (5); D. VIII—12; A. 12. Scales (transverse series), 77; pores in lateral line about 48. Length, $3\frac{3}{8}$ inches.

Allied to *Prionotus evolans.** Body not very slender; narrowed but compressed above, the width of the nape between the occipital spines being about one-fifth the head. Head depressed and long, its upper profile being a little concave before eye, thence slightly convex or almost straight to front of dorsal. Snout $2\frac{1}{2}$ in head, not very broad, rather more than usually rounded anteriorly and scarcely emarginate at tip. Edges of snout without spine and without distinct serræ, the margin merely granular. Surfaces of bones of head comparatively smooth, but roughened with small granules, which are arranged in radiating striæ, much as in *P. evolans*, but more regularly than in that species.

* *Prionotus sarritor* Jordan & Gilbert, Proc. U. S. Nat. Mus., 1882, 615. The type of *Trigla evolans* L. in London has been examined by Dr. Bean. It is apparently identical with *P. sarritor*.

Mouth rather wide, the maxillary reaching to opposite front of the eye, the mandible about to center of eye; maxillary 2 in head. Bands of palatine teeth narrow.

Eye small, its diameter (in young specimen) $4\frac{2}{3}$ in head. A very small cirrus formed of two or three thickish filaments from a common base on upper part of eye; its length little more than half the pupil. Interorbital area of moderate width, rather deeply concave, its least width $6\frac{1}{2}$ in head. Orbital rim not at all elevated, its bones with entire or granulated edges. No trace of spine or groove behind eye. Occipital spines very weak, the outer pair inconspicuous, not reaching nearly to front of dorsal, the inner pair altogether wanting, no trace of them being seen. No spines, ridges, or evident roughness on temporal region. Preopercle with a single small spine, without smaller one at its base. Lower opercular spine small; upper opercular spine reduced to a blunt point. Humeral spine inconspicuous, not extending beyond opercular spine. The head is thus much less completely armed than in any other of our species of *Prionotus*, the only spinous projections present being the occipital, humeral, opercular, and preopercular spines, 4 pairs. These spines may perhaps become more prominent with age. Membranaceous flap of opercle scaly.

Gill-rakers long and very slender, about thirteen developed, the length of the longest about half eye.

Scales rather large, those on the nape and breast little reduced in size; about 10 between dorsal and occiput.

Fins all low and small. First dorsal spine rather the highest, its length $2\frac{1}{3}$ in head, its anterior margin serrulate. Longest ray of soft dorsal, 2 in head. Caudal, $1\frac{1}{3}$ in head. Longest anal ray, 2 in head. Pectorals very short (perhaps longer in the adult), reaching only to front of second dorsal, $1\frac{1}{4}$ in head. Detached rays slender, the uppermost $1\frac{3}{4}$ in head. Ventrals, $1\frac{1}{3}$ in head.

Color in spirits, brown, paler below; scales everywhere with dark punctulations, these forming a darker shade on the lateral line near the middle of the body; head plain brown. Spinous dorsal dusky posteriorly. Soft dorsal with two dusky longitudinal shades. Caudal blackish at tip. Anal with a black stripe toward the margin. Pectorals black, the detached rays and ventral fins plain whitish.

The type of this species, $3\frac{3}{8}$ inches long, in good condition, was "spewed up" by a red snapper (*Lutjanus vivanus*), at Pensacola.

Prionotus ophryas, sp. nov. (No. 36944.)

Head 3 in length ($3\frac{5}{7}$ with caudal); depth $4\frac{1}{2}$ ($5\frac{2}{6}$). D. VIII—13; A. 11. Scales (transverse series, about), 75; pores in lateral line (about), 50. Length $7\frac{1}{4}$ inches.

Allied, but not closely, to *Prionotus tribulus*. Body rather slender, narrower anteriorly and more compressed above than in other species,

the width of the nape between the outer pair of occipital spines being not quite one-fourth the length of the head. Upper profile of head peculiar, being nearly straight from above front of eye backward, and steep and strongly concave from front of eye to tip of snout. The snout is, therefore, steeper, more depressed, and rather shorter than in related species, its length being 2¼ in head. Snout not very broad, its front broadly rounded, its tip, as usual, emarginate, its edge with fine serræ directed backward, but no spines. Surfaces of bones of the head covered with fine, sharply-defined striæ, but with none of the small granulations which are found in *P. strigatus* and other species.

Mouth rather wide, the maxillary reaching nearly to front of eye, the mandible quite to front of eye. Maxillary, 2½ in head. Band of palatine teeth of moderate length, as long as eye.

Eye large, placed high, its diameter 4½ in head. Upper part of eye with a fleshy cirrus rather enlarged toward the tip and fringed. This resembles the cirri in *Scorpæna*; its length is about half that of the eye. Interorbital area very narrow and very deeply concave, its least width little more than one-eighth the length of the head and not two-thirds the length of the eye. Depth of interorbital area nearly one-third length of eye. Bone forming anterior portion of orbital rim very prominent, forming a strongly striated crest, each of the striæ ending in a projecting point or spinule. Upper portion of orbital rim prominent, even, ending behind the eye in a sharp backward-directed spine, behind which is a short cross-groove, which does not extend across the top of the head. Distance from the base of this spine to the scales on the nape very short, not more than half the length of the eye. Both pairs of occipital spines distinct, the outer and larger ones extending to opposite front of dorsal. A small spine on temporal region in front of outer pair of spines. Preopercle with a single moderate spine, at the end of a long ridge; no smaller spine at its base. Opercle strongly striate, with two strong spines, of which the upper one is proportionately larger than usual. A single, rather strong humeral spine; membranaceous flap of opercle scaly.

Gill rakers very short and thick, about 9 developed, these not half longer than the interspaces, and not one-fourth length of eye. They are about half as broad as high, thus having a form very different from that seen in *P. evolans*, *P. strigatus*, *P. tribulus*, &c.

Scales rather large, the scales on the back little reduced in size (about 10 between occiput and dorsal fin; 17 in *P. strigatus*).

Dorsal spines high and rather slender, the first rather the highest, its length 1½ in head, its anterior margin not granulated. Soft dorsal rather high, its longest ray 2 in head. Caudal 1⅓ in head; longest anal ray 2⅓ in head. Pectorals rather long, extending nearly to last rays of dorsal, their length almost twice head. Detached rays moderate, the uppermost or longest 1⅓ in head. Ventrals 1⅙ in head.

Coloration largely faded in the typical example; apparently olive-

brown above, with some vague darker cross-shades; pale below; caudal with two dark cross-bands; pectoral dusky; the free rays with dusky spots; ventrals pale, with some dusky bands; coloration of dorsal and anal mostly lost; apparently much as in *P. strigatus;* head nearly plain; the cirri dark.

This species is described from one specimen, 7¼ inches long, in fair condition, but with the membranes of the fins somewhat digested. It was taken from the stomach of a red snapper (*Lutjanus vivanus*), at Pensacola, by Mr. Silas Stearns. The short gill-rakers, and deeply concave interorbital area, distinguish this species at once from all others.

The collection in which these two species of *Prionotus* were included, contained among other interesting species the following:

Seriola dumérili Risso.

Anthias vivanus, sp. nov. (No. 36942.)

Body oblong, elliptical, strongly compressed; the snout rather short, and anteriorly pointed; the profile from snout to dorsal quite steep, and very slightly convex; back gently arched; its curve corresponding very nearly with that of the belly. Snout rather shorter than eye, which is 3⅓ in head; mouth oblique, the lower jaw projecting (upper jaw mutilated); cleft of mouth extending to below front of pupil; its length, 2¾ in head; interorbital area convex; its width about three-fourths eye: lower jaw with small, fixed, backward turned teeth, mostly in one row; two small recurved canines on side of lower jaw, near the front, and one on each side near the symphysis; preopercle sharply serrate; the tooth at the angle considerably enlarged, projecting backward; lower limb entire, except near the angle; opercle with two sharp spines, besides an acute flat point; the uppermost spine longest. Gill-rakers very long and slender, almost setiform, numerous, and close set.

Scales of moderate size, weakly ctenoid (those on head mostly lost). Lateral line strongly arched, concurrent with the back and running very close to the dorsal fin, under the middle of the spinous dorsal, falling abruptly under last rays of soft dorsal to middle of caudal peduncle, thence straight to base of caudal fin.

Dorsal spines low, rather strong, none of them filamentous, gradually increasing in length to the fourth, which is 2⅔ in head, thence growing slowly shorter to the ninth, which is 4 in head. Soft dorsal and anal moderately elevated, their last rays somewhat more than half head and nearly reaching base of caudal. Second anal spine about as long as third, 2¾ in head (caudal and ventral fins mutilated). Pectoral fin well developed, a little shorter than head. Color in spirits, olivaceous above, somewhat rosy below; back, with numerous faint narrow olivaceous cross shades, formed of dark points. Head and fins plain.

Head, 3⅗; depth, 3⅛. D. X, 13; A. III, 8. Scales, 2½–43–12.

A single specimen, about 2½ inches long, was taken from the stomach of a red snapper (*Lutjanus vivanus*) at Pensacola by Silas Stearns. This

Vol. VII, No. 35. Washington, D. C. Feb. 16, 1885.

species is allied to *Antheas multifasciatus* Gill, described from Cape San Lucas.

Serranus, sp. nov.

A single specimen from which most of the skin and scales has been digested. It is allied to *S. bivittatus* C. & V.

Lobotes surinamensis Bloch.

Decodon puellaris Poey.

Pomacentrus caudalis Poey. (No. 36945.)

(Synopsis Piscium Cubensium 1868, 328.)

One specimen in good condition. Head, $3\frac{1}{2}$ in length; depth, $2\frac{1}{6}$. D. XII, 14; A. II, 13. Scales, 4–29–9. Upper parts dusky; the greater part of each scale of a light grayish blue; lower parts bright yellow, with some blue spots on the scales; top and sides of head similarly marked with bluish spots on the scales. A jet black, ink-like spot, ocellated with blue on the back of the tail. Dorsal fin colored like the back; the posterior soft rays abruptly yellow. Caudal fin bright yellow, lower fins chiefly yellow.

Form oblong-ovate; the anterior profile moderately convex. Preorbital and preopercle well serrated. Teeth moderate, entire. Soft parts of dorsal and anal rather high.

This is the first record of this rare species on our coasts.

Porichthys porosissimus Cuv. & Val.

INDIANA UNIVERSITY,
December 4, 1884.

SUPPLEMENTARY NOTES ON NORTH AMERICAN FISHES.

By DAVID S. JORDAN.

The following notes on points connected with North American ichthyology are mostly supplementary to statements contained in different papers published by the writer in these Proceedings for the current year 1884.

Cryptotomus, Cope.

On page 100, Proc. U. S. Nat. Mus., 1884, we observe, "It seems to us almost certain that either Professor Cope has mistaken two of the soft rays of the dorsal and one of the anal for spines, or else that these rays are, in the single specimen (of *Cryptotomus roseus*) known, abnormally ossified." Since this was written I have examined Professor Cope's type of *Cryptotomus roseus*, and I find the former supposition to be correct. This specimen has nine dorsal and two anal spines.

Apogon imberbis.

The specimen from Newport, R. I., recorded by Professor Cope as *Apogon americanus*, Proc. Ac. Nat. Sci., Phila., 1870, 119, belongs to *Apogon imberbis*. This is the only record of this European species on our coasts. I am assured by Professor Gill that there is no doubt that these specimens obtained by Mr. Samuel Powell really came from Newport.

Rhypticus bistrispinosus.

The specimen recorded in the same paper as *Promicropterus decoratus* I am unable to distinguish from *Rhypticus maculatus* Holbrook. It is certainly not the real *decoratus* (=*nigripinnis* Gill). The name *Bodianus bistrispinosus* Mitchill, has priority over Holbrook's name *maculatus* for this species.

Rhypticus saponaceus.

The specimen described by Cope (Trans. Am. Philos. Soc., 1871) as *Eleutheractis coriaceus*, I cannot distinguish from *Rhypticus saponaceus*.

Clupea mirabilis.

The type of *Spratelloides bryoporus* Cope, Proc. Am. Philos. Soc., Phila., 1873, belongs to *Clupea mirabilis* Girard.

Hemirhamphus pleei.

The species recorded by me (Proc. U. S. Nat. Mus., 1884, 113) from Key West as *Hemirhamphus balao* is probably distinct from the true *H. balao;* it may stand as *Hemirhamphus pleei.*

CATESBY'S FISHES.—In my paper on the fishes of Catesby (Proc. U. S. Nat. Mus., 1884, 190), I have overlooked the following names of Walbaum, based on figures of Catesby.

Labrus maximus Walbaum, Artedi Piscium, 1792, 261, based on Suillus of Catesby. This name has priority over *Lachnolæmus suillus* of Cuvier, and the species should stand as *Lachnolæmus maximus.*

Perca gibbosa Walbaum l. c., 348, based on the Margate-fish of Catesby. This is prior to *Calliodon gibbosus* Bloch & Schneider, as the designation of *Hæmulon album* Cuv. & Val.

Perca apoda ("Forster Catal. Anim., 21") Walbaum l. c., 351, based on the Schoolmaster of Catesby. This is either *Lutjanus caxis* or *L. jocú*, probably the former, but as both are confounded by most fishermen under the name of "Schoolmaster," it is hardly necessary to adopt the inappropriate name of *Lutjanus apoda* instead of *L. caxis.*

Serranus furvus.

The name *Perca furva* Walbaum l. c., 337, based on the Blackfish of Schöpf, has priority over *Coryphæna nigrescens* of Bloch & Schneider. If, therefore, our Northern Blackfish is distinct from the Southern *Serranus atrarius*, as Holbrook and Bean have maintained, it may stand as *Serranus* (*Centropristis*) *furvus.*

Mugil brasiliensis.

The identification of *Mugil brasiliensis* Agassiz with *Mugil trichodon*, made by us on page 270, is probably too hasty.

The type of *M. brasiliensis*, as described by Dr. Spangenberg, must be either *M. liza* or *M. trichodon*. It is, however, on the whole more likely to have been the former than the latter.

Hæmulon canna and schranki.

I have received from Dr. Spangenberg, of the Museum of Munich, the following notes on the types of *Hæmulon canna* Agassiz and *Hæmulon schranki* Agassiz:

"We possess one example of *Hæmulon canna* 24.5 centimeters long from snout to base of caudal. Of *Hæmulon schranki* we have a bottle with four specimens, although by Spix and Martius only two are mentioned. Two of these agree closely with their diagnosis; the others have probably been placed in the same bottle by some one's carelessness, and are not original types. Those which I regard as types are 13 and 13.6 centimeters long to base of caudal. It is difficult to separate the two species by certain marks. They are best distinguished by the scaling on the caudal, pectoral, and ventrals, and by the length of the gape. All the other differences perhaps may disappear with age.

	Canna.	Schranki.
Length in centimeters to base of caudal	24.5	13
Length of head (hundredths of length)	.31¾	.36
Height of head at occiput (hundredths of length)	28	.30
Greatest depth at occiput	.36	.37
First anal spine in second	4⅔ times.	3⅓ times.

"In *H. canna* the gape extends little beyond the first third of the length of the orbit. In *H. schranki* it extends to beyond the end of the second third.

"In *H. canna* the space between the eyes is convex in both directions. In *H. schranki* the interorbital area is concave.

"In *H. canna* all the fins are covered with fine scales; the pectorals, the ventrals, the caudal nearly to the tips, both on the rays and the interspaces. In *H. schranki* the fins are scaly, except the pectorals, ventrals (only on the base); somewhat farther up on the rays are little scales, none on the interspaces; caudal scaled only at base.

"In *H. canna* the pectorals are broad, somewhat triangular. In *H. schranki* they are slenderer and longer.

"The nostrils are not correctly described by Spix and Martius.

"In *H. schranki* is the dorsal profile rather uniformly convex. In *H. canna* the depressed profile of the head breaks the almost straight line of the first dorsal. A rather sharp angle is made under the soft dorsal.

"The coloration in both is totally lost."

I am still unable to positively identify either of these species.

Hæmulon fremebundum.

Hæmulon fremebundum Goode & Bean has been redescribed under the name of *Diabasis lateralis* by Vaillant & Bocourt, Mission Scientifique au Mexique iv, 180, 1883, from Jamaica.

Sciæna ensifera.

Corvina fulgens Vaillant & Bocourt, l. c., 164, is the prior-named (1882) *Sciæna ensifera* of Jordan & Gilbert.

Enneacentrus fulvus ruber.

The scarlet variety of *Enneacentrus fulvus* should stand as *Enneacentrus fulvus ruber*, instead of *ouatalibi*, as inadvertently given by us on page 402.

Notropis lirus.

Notropis alabamæ, described by Jordan & Meek on page 476, proves to be inseparable from *Notropis lirus*.

Pœcilichthys jessiæ.

Pœcilichthys swaini (page 479) is based on an individual indistinguishable from *P. jessiæ* except that the lateral line is complete. A larger series of specimens shows that this "generic" character has here not even specific value. *Pœcilichthys asprigenis* Forbes seems also to vary into *P. jessiæ*.

Boleosoma maculatum.

Pœcilichthys beani Jordan (l. c., 479) is based on a somewhat mutilated individual of *Boleosoma maculatum*.

The poor condition of the specimen misled me as to its generic relations.

INDIANA UNIVERSITY, *December* 6, 1884.

DESCRIPTION OF A NEW SPECIES OF HYBOGNATHUS (HYBOGNATHUS HAYI) FROM MISSISSIPPI.

By DAVID S. JORDAN.

In the Bulletin of the United States Fish Commission, 1882, p. 67, Prof. O. P. Hay has correctly distinguished two species of *Hybognathus* from specimens collected by him in streams of Mississippi and Western Tennessee. For these species he has adopted the names of *Hybognathus nuchalis* Agassiz and *H. argyritis* Girard. There is no doubt that the *H. nuchalis* is correctly identified. The specimens called *argyritis* by Professor Hay, belong, however, to a species different from the original types of *argyritis* Girard, with which I have compared them. I regard them as a distinct species, for which I propose the name of *Hybognathus hayi*.

Head $4\frac{2}{5}$ in length ($5\frac{2}{5}$ with caudal); depth $4\frac{3}{7}$ ($4\frac{4}{5}$). D. 8; A. 8. Scales 5–36–3.

Body comparatively elongate, the caudal peduncle rather longer and slenderer than in *H. nuchalis*, and the back somewhat more elevated at base of dorsal. From the insertion of the first ray of dorsal the profile is more rapidly declined both anteriorly and posteriorly than in *H. nuchalis*.

Head small and rather low, evenly rounded above. Snout short, rather less obtuse than in *H. nuchalis*, 4⅓ in head. Eye large, larger than in *nuchalis*, longer than snout, 3⅔ in head. Premaxillaries in front higher than in *nuchalis*, on the level of the lower part of pupil. Maxillary a trifle longer than in *H. nuchalis*, not quite reaching to eye, its length about 5½ in head. Mouth rather more oblique than in *H. nuchalis*, the lower jaw scarcely shorter than the upper when the mouth is closed. Lower jaw rounded, slightly less obtuse than in *H. nuchalis*. Suborbital bones very narrow, much narrower than in *H. nuchalis* or *H. argyritis* (somewhat variable in all three species), the anterior suborbital about three times as long as deep. In *H. nuchalis* it is usually not twice as long as deep. Scales, lateral line, and fins essentially as in *H. nuchalis*, the dorsal rather higher, its anterior rays as long as head.

Color, bluish above, silvery below, a silvery lateral shade. Fins pale.

Alimentary canal (according to Hay) shorter than in *H. nuchalis;* 4½ to 7½ times length of body.

Length of largest specimen, about 4 inches.

Specimens of this species have been sent to the National Museum by Professor Hay, from Memphis, Tenn., and from Vicksburg, Edwards, Jackson, Vaughans, and Grenada, Miss. No. 32306, from the Pearl River, at Jackson, may be regarded as the special types of the species.

Of *Hybognathus nuchalis*, I have examined many specimens from the Delaware River, and from various streams in Indiana, Illinois, Kentucky, Tennessee, Alabama, Mississippi, Iowa, Kansas, Wyoming, Missouri, Arkansas, and Texas. The only variations I notice in these may be thus summarized: Certain Iowa specimens (Des Moines R.; Hundred and Two River) are dusky in color, instead of the usual bluish-silvery shades. Some Alabama specimens have the eye larger, almost as large as in *H. hayi*. In other specimens, from Kansas, from the Missouri River (Saint Joseph), and from the Arkansas River (these the types of *Hybognathus placitus* Girard), the eye is smaller (4 to 4½ in head) and there are some slight differences in proportions, the caudal peduncle being less slender, &c. These possibly represent a distinct subspecies, or even species (*placita*), but I think that a full series will show complete intergradation with *H. nuchalis*. The suborbitals are alike in both, as also in all the real and supposed species of *Hybognathus*, excepting *H. hayi*. Specimens from the Potomac are larger in size (6 inches or more) than any others I have ever seen. These are also less elongate than the Western specimens, and the eye is proportionately larger (3¾ in head). Otherwise I can detect no difference. These specimens represent the *Hybognathus regius* of Girard, which for the present we may regard as a distinct sub-

species (*Hybognathus nuchalis regia*). The *Hybognathus osmerinus* Cope, from the Delaware River, I cannot distinguish from the ordinary *nuchalis*.

The types of *Hybognathus argyritis* Girard from the Upper Missouri River seem to represent a species distinct from *H. nuchalis*. The mouth is larger, larger even than in *H. hayi*, its cleft extending nearly to the eye; the jaws are subequal, the lower angular at tip; the suborbitals are broad as in *H. hayi*. In other respects it agrees essentially with *H. nuchalis*.

The types of *Hybognathus evansi* Girard are not preserved, but from the description I infer that it is identical with *H. nuchalis*.

The small species of the Texan region, to which Girard has given the names of *Dionda* and *Algoma* may, perhaps, be regarded as generically distinct from *Hybognathus*, the pharyngeal teeth being somewhat different in form.

Of these species the following appear to be valid:

*Dionda nubila** Forbes.

*Dionda episcopa** Girard=*Dionda texensis** Girard=(?) *Dionda papalis* Girard=*Dionda argentosa** Girard=(?) *Dionda chrysitis* Girard=*Hybognathus flavipinnis* Cope.

*Dionda serena** Girard=*Hybognathus nigrotæniatus* Cope.

Dionda punctifera Garman.

Dionda melanops Girard=*Dionda couchi** Girard.

Dionda fluviatilis Girard.

*Dionda amara** Girard.

INDIANA UNIVERSITY,
December 16, 1884.

ON THE OCCURRENCE OF LONCHERES ARMATUS, (GEOFF.) WAGNER, IN THE ISLAND OF MARTINIQUE, WEST INDIES.

By FREDERICK W. TRUE,
Curator of the Department of Mammals.

Among the specimens of West Indian animals received from Mr. F. A. Ober in 1878, was a skin (13039) of a large spiny-rat belonging to the genus *Loncheres*. After a careful comparison with the descriptions of Waterhouse and Burmeister, I am inclined to believe that the specimen should be classed with *L. armatus*, (Geoff.) Wagner.

The color of the upper surface of the animal is a mixture of pale naples yellow, black (or deep brown), and rufous. The rufous color becomes strong on the rump and head, and affects the general coloration least on the shoulders and upper surfaces of the fore limbs. A hair taken from the middle line of the back near the rump exhibits the following colors: Lower two thirds gray, light at the base, and grow-

*Of those nominal species marked with the asterisk (*) the types are now in the National Museum.

ing darker upward; upper third, except the extreme tip, clear light rufous; extreme tip very dark brown or blackish. The colors of a spine from the same region are similar, but the rufous ring and terminal blackish area occupy together only the upper fifth of the spine. On the shoulders the general arrangement of colors is the same, but the majority of the spines are gray throughout, light at the base and dark at the tip, and the subterminal ring of the hairs is naples yellow instead of rufous.

The under surface of the body is clothed with rather harsh, mostly flattened, hairs, which are of a very pale grayish color throughout their lower half and very light opaque yellowish-white above. The upper surfaces of the hands and feet have the color of the shoulders.

The tail is sparsely clothed with flattened, lustrous, faintly-brownish hairs about a half inch in length, which do not obscure the scales.

	Inches.
Length of head and body	9.9
Length of tail	8.0
Length of hind foot (without claws)	1.5
Length of fore foot	.8
Height of ear-conch	.4

The occurrence of this South American form in the island of Martinique is an interesting but not unparalleled fact. The venomous Lancehead serpent (*Bothrops lanceolatum*), indigenous to South America, is also found in considerable abundance in Martinique and some of the adjacent islands. The absence of any allusions to the occurrence of the Strong-spined Loncheres in the Carribees would seem to indicate that the species has been recently introduced. It is probable that a considerable number of species of the smaller South American rodents are brought over to the islands from time to time by sailing vessels and otherwise, which, being unable to breed, live out their natural term and then disappear.

Mr. Ober procured but a single specimen of the rodent under consideration, and there is nothing in his book upon the Carribees, or upon the label, indicating that the species is at all common in Martinique.

DECEMBER 19, 1884.

NOTES ON FISHES COLLECTED AT SAN CRISTOBAL, LOWER CALIFORNIA, BY MR. CHARLES H. TOWNSEND, ASSISTANT, U. S. FISH COMMISSION.

By ROSA SMITH.

1. Rupiscartes* atlanticus Cuv. & Val. (No. 36946.)

Head, 4 (5 in total); depth, 4½ (5½). D. XII, 22; A. II, 23.

Body rather slender, gradually tapering backward from the head. Head not very broad; its greatest breadth 1½ in greatest depth; profile

* Following a suggestion of Professor Jordan, I use the name *Rupiscartes* of Swainson for the species of *Salarias* having canine teeth.

blunt, nearly perpendicular from front of mouth to the nostrils, thence nearly straight to beginning of dorsal fin. Mouth moderate, the maxillary ending opposite the pupil, its length 3 in head; the upper jaw overlaps the lower; the lips are edged with fine scallops, which are most conspicuous in front; the upper jaw is without canines, the small movable teeth extending along the sides; teeth of the lower jaw not extending far along the sides; a large, sharp, strongly-curved tooth on each side of the lower jaw, which is placed, not on a line with the fine comb-like teeth, but inward and backward from the margin a distance equal to one-half the diameter of the eye. The eye equals the length of the snout, 3 in head; interorbital space flat, a little wider than half the orbital diameter.

A short, unbranching tentacle above each eye, one-third as long as the eye is wide; nasal opening forming a short tube with a multifid tentacle on its upper inner margin, the longest filament equaling the orbital tentacle in length; very short multifid nuchal tentacles, the height of the filaments equaling their base, which extends perpendicularly, and therefore does not form a median crest. Gill-openings forming a broad fold across the isthmus.

Dorsal fin rather high, continuous, with only an obsolete notch between the spinous and soft portions; spines very flexible, nearly uniform in height, the highest one $1\frac{3}{4}$ in head, and equal to the highest soft ray, the articulate portion of the fin about even to the sixteenth ray, whence the fin decreases to the last ray, which is two-thirds the height of the first. Anal fin lower than the dorsal, its highest ray 2 in head. Caudal very nearly as long as the pectoral fin, which equals the head; ventrals $1\frac{1}{2}$ in head.

Lateral line little arched above the pectoral, continuing parallel with the dorsal outline to opposite the fifth articulate ray (or a little anterior to the middle of the dorsal fin), the line terminating abruptly, where, midway between dorsal and ventral surfaces, a series of more obscure pores originates, which extends in an almost straight line to the base of the caudal fin.

Color, in spirits, olivaceous, marked with darker. Seven squarish dark spots along middle of sides, above which and more or less separated from the lower ones are as many other irregular dark spots extending upon the base of the dorsal fin, the two series of spots together forming broken vertical bands; ground color of the dorsal dark gray; the anal dusted with black points, which give the fin a uniform gray appearance; no paler or yellowish edging to dorsal or anal; caudal, pectoral, and ventral fins smutty with minute dark dots, and the skin everywhere finely punctate with blackish; top of head evenly dark gray; a blue-black ocellated spot, edged with gray behind the orbit, and continuous with the edging a narrow band of gray outlines the suborbital ring to the corner of the mouth.

Three specimens, the largest $2\frac{1}{8}$ inches in length, were collected by

Mr. Charles H. Townsend from a rock pool at San Cristobal, Lower California, 500 miles southward from San Diego, Cal.

There seems to be no doubt that these specimens belong to the species called by Jordan & Gilbert *Salarias atlanticus*. It is, however, yet to be compared with Atlantic examples.

The specimens have been sent to the United States National Museum.

Rupiscartes atlanticus was accompanied by the young of *Girella nigricans* and *Pomacentrus rubicundus*, and by *Oligocottus analis*, *Gobiesox rhessodon*, *Cremnobates integripinnis*, and *Labrosomus xanti*. Two specimens of the last were secured by Mr. Townsend. The larger of these is nearly 2½ inches in total length and agrees with Jordan & Gilbert's description of *Clinus nuchipinnis*, except in the one character, which, according to Jordan & Gilbert, is the only feature separating *xanti* from *nuchipinnis*, namely, in having three large bluntish teeth on the vomer in the form of a triangle.

"This species [*xanti*] is extremely close to the *Clinus nuchipinnis*, differing, in the specimens examined, in the arrangement of the teeth on the vomer. In *xanti* there are three large bluntish teeth forming a triangle; *nuchipinnis* one large tooth and about six smaller ones forming a V-shaped figure. In *nuchipinnis* there is always a distinct black blotch on the opercle, which is faint or obsolete in *xanti*. In form, structure of fins, numbers of scales, &c., we are unable to find any differences." (*Jordan & Gilbert.*)

Now, the other example from San Cristobal is only a little more than 1½ inches long and *has six or seven small teeth on the vomer*, which are pointed though somewhat blunt. The markings on both specimens are well defined, excepting the "black blotch on the opercle," which is wanting on the smaller example. The lateral "vertical bands" extend upon the dorsal fin to its margin, anteriorly, and on the base of that fin posteriorly. The anal has eight squarish dark vertical bars, alternating with lighter of similar form and size, some of the anal bars being continuous with those of the sides.

These specimens of *Labrosomus* have been sent to the United States National Museum.

SAN DIEGO, CAL., *December* 19, 1884.

PROCEEDINGS UNITED STATES NATIONAL MUSEUM.

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APPENDIX.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 24.

PLAN OF A COLLECTION TO ILLUSTRATE THE TEXTILE INDUSTRIES OF THE UNITED STATES, TO BE EXHIBITED AT THE WORLD'S INDUSTRIAL AND COTTON CENTENNIAL EXPOSITION OF 1884–1885, AT NEW ORLEANS.

By ROMYN HITCHCOCK,
Acting Curator, Section of Textile Industries.

The National Museum will exhibit a collection of fibers and fabrics, illustrative of the textile resources and manufactures of the United States, at the World's Industrial and Cotton Centennial Exhibition, which opens at New Orleans in December, 1884.

In preparing the exhibits the Museum will draw largely upon its present store of material, which, as the following pages will show, is extensive and varied. Many articles, however, are needed to make the collections as complete as it is desirable they should be. Some of the more pressing wants are mentioned in this announcement, and manufacturers and friends of the Museum are invited to make such contributions as are necessary to supply these and other deficiencies.

On the following pages will be found a very general account of the collections in the Museum, which is given more as an indication of the character of the material at hand and of the nature of the work in progress, than as even an approximately perfect catalogue of the specimens.

In the preliminary list of textile fibers, and in all succeeding lists, the numbers given are the numbers designating the specimens in the Museum records.

TEXTILE FIBERS.

PRELIMINARY LIST OF TEXTILE FIBERS IN THE NATIONAL MUSEUM.

5215. *Abelmoschus ficulneus.* India.
5175. *Abies Canadensis*, Hemlock Spruce. (Bark.) British Columbia.
5244. *Adiantum* sp. Maiden Hair Fern. (Stalks.) Hawaii.
5187. *Æschynomene aspera.* (Hat made of stems.) India.
5313. *Agave* sp. San Salvador.

5314. *Agave* sp. (Leaves.) San Salvador.
5348. *Agave* sp.
5060. *Agave* sp. Maguey. Guatemala, Central America.
5268. *Agave* sp. Maguey. Guatemala, Central America.
5327. *Agave.*
15388. *Agave Americana.* Costa Rica.
5035. *Agave Americana.*
5334. *Agave Americana.* Jamaica.
5317. *Agave Americana*, Mescal. San Salvador.
5034. *Agave Americana.*
5003. *Agave Deserti*, Mescal. California.
5335. *Agave Karatto.* Jamaica.
5252. Algodon Elastico (Kapok ?). Guatemala.
Aloe, American. See *Agave.*
5190. *Alpina* sp. N. Formosa.
5133. *Ananassa sativa*, Pineapple Hemp. China.
5015. *Ananassa sativa*, Pineapple Hemp. East Indies.
5058. *Ananassa sativa*, Pineapple Hemp. India.
5338. *Ananassa sativa*, Pineapple Hemp. Jamaica.
5315. *Anona* sp. Bark. San Salvador.
5197. Areca Palm, Spathe (Fan.) Formosa.
5207. *Arundo phragmites.* (Grass whisk.) Italy.
5124. *Attalea funifera*, Piassaba. Brazil.
5059. Banana (?), *Musa sapientum* (?). Central America.
5341. Banana (?), *Musa sapientum* (?). Jamaica.
5212. *Barringtonia* sp. (Bark.) Zambesi.
5103. Basket Palm, Buri, *Corypha umbraculifera.*
5275. Basket Palm, Buri, *Corypha umbraculifera.*
5276. Basket Palm, Buri, *Corypha umbraculifera.*
5277. Basket Palm, Buri, *Corypha umbraculifera.*
5057. Bastard Jute, *Hibiscus cannabinus.* East Indies.
5188. Betula Bark, Bhoj. East Indies.
5016. *Bœhmeria nivea*, China Grass. Siam.
5101. *Bœhmeria nivea*, China Grass. East Indies.
5126. *Bœhmeria nivea*, China Grass. China.
5129. *Bœhmeria nivea*, China Grass. China.
5130. *Bœhmeria nivea*, China Grass. China.
5131. *Bœhmeria nivea*, China Grass. China.
5132. *Bœhmeria nivea*, China Grass. China.
5134. *Bœhmeria nivea*, China Grass. S. Formosa.
5135. *Bœhmeria nivea*, China Grass. S. Formosa.
5136. *Bœhmeria nivea*, China Grass. China.
5138. *Bœhmeria nivea*, China Grass. China.
5139. *Bœhmeria nivea*, China Grass. China.
5198. *Bœhmeria nivea*, China Grass. Kew, England.
5300. *Bœhmeria nivea*, China Grass. China.

5301. *Bœhmeria nivea*, China Grass. N. Formosa.
5323. *Bœhmeria nivea*, China Grass. China.
5299. *Bœhmeria nivea*, China Grass. Siam.
5297. *Bombax* sp. Mexico.
5321. *Bombax ceiba*, Pochote. San Salvador.
5340. *Bromelia* (*Karatas*), Silk Grass. Jamaica.
5339. *Bromelia pinguin*, Pinguin Fiber. Jamaica.
5329. *Bromelia sylvestris*, Istle. Mexico.
5191. *Broussonetia papyrifera.* (Tapa Cloth.) Hawaiian Islands.
5208. *Broussonetia papyrifera.* (Tapa Cloth.) Hawaiian Islands.
5201. *Broussonetia papyrifera.* (Paper.) Japan.
5220. *Broussonetia papyrifera.* (Paper.) Japan.
5275. Buri, *Corypha umbraculifera.* (Hat.) Philippine Islands.
5276. Buri, *Corypha umbraculifera.* (Hat.) Philippine Islands.
5277. Buri, *Corypha umbraculifera.* (Hat.) Philippine Islands.
5103. Buri, *Corypha umbraculifera.* (Bags.)
5018. *Cannabis sativa*, Hemp. East Indies.
5312. Capulin Fiber. San Salvador.
5026. *Carludovica palmata.* Brazil.
5265. *Carludovica palmata.* Brazil.
5345. *Cecropia peltata*, Trumpet Bark. Jamaica.
5193. *Chamærops excelsa*, Coir. N. Formosa.
5123. *Chamærops excelsa*, Coir. China.
5124. *Chamærops excelsa*, Coir. N. Formosa.
5214. *Chamærops excelsa*, Coir. N. Formosa.
5181. *Chamærops serrulata*, Palmetto Leaves. Florida.
5182. *Chamærops humilis.* (Mat.) Portugal.
China Grass. See *Bœhmeria.*
5249. *Cibotium* sp. Guatemala.
5250. *Cibotium* sp. Guatemala.
5169. *Cibotium*, Pulu. Hawaiian Islands.
5320. *Cibotium* sp. Lanilla (?). San Salvador.
5344. *Cocos nucifera*, Coir. Jamaica.
Coir. See *Chamærops excelsa, Cocos nucifera.*
5326. *Conocephalus niveus.*
5178. *Corchorus* (*capsularis?*) Jute. Mississippi.
5303. *Corchorus* (*capsularis?*) Jute Butts. Calcutta.
5210. *Cordia myxa.* (Bark.) India.
Cotton *Gossypium*, sp. See special list of cottons.
5043. *Crotolaria juncea*, Sunn Hemp. East Indies.
5184. *Cyperus tegetiformis*, Sea Side Grass. (Cuff.) N. Formosa.
5189. *Cyperus tegetiformis*, Sea Side Grass. (Shoe.) N. Formosa.
5192. *Cyperus tegetiformis*, Sea Side Grass. (Shoe.) China.
5054. Cypress, Swamp. Inner bark.
5019. Date palm, *Phœnix sylvestris.* (Leaf.) India.
Dagger plant fiber. See *Yucca.*

5045. *Doryanthus excelsa.* Australia.
5274. *Epicampa ringens.*
5218. *Eriodendron anfractuosum*, Kapok. Java.
5219. *Eriodendron anfractuosum*, Kapok. Java.
5221. *Eriodendron anfractuosum*, Kapok. Java.
5321. *Eriodendron anfractuosum.* (?) Pochote. San Salvador.
5267. Escobilla. Guatemala.
Esparto. See *Stipa tenacissima.*
Flax. See *Linum usitatissimum.*
5336. *Fourcroya Cubensis*, Hennequen. Jamaica.
5213. *Fourcroya gigantea*, Mauritius Hemp.
5266. *Fourcroya gigantea*, soft pita or aloe fiber. Guatemala.
5318. *Fourcroya gigantea.* San Salvador.
5319. *Fourcroya gigantea.* San Salvador.
5047. *Fourcroya gigantea.* Spain.
Grass Fiber. See *Arundo, Cyperus, Pollonia*, Tsukkus. *Xerophyllum.*
5173. Hair, human. China.
5246. Hau, Olona. Hawaiian Islands.
5175. Hemlock-spruce, *Abies canadensis.* British Columbia.
Hemp. See *Cannabis sativa.*
5044. Hemp, Bowstring. *Sanseviera zeylanica.* East Indies.
5337. Hemp, Bowstring, *Sanseviera Guineensis.* Jamaica.
5057. Hemp, Indian, *Hibiscus cannabinus.* East Indies.
24237. Hemp, Indian, *Sesbania* sp. Arizona.
5014. Hemp, Manila, *Musa textilis.*
5133. Hemp, Pineapple, *Ananassa sativa.*
5246. Hemp, Hawaiian Island, Olona, Hau. (*Musa textilis?*)
Hemp, Chinese. See *Bœhmeria nivea.*
5043. Hemp, Sunn, *Crotolaria juncea.* East Indies.
5336. Hennequen, *Fourcroya Cubensis.* Jamaica.
5046. *Hibiscus sabdariffa.* Rouselle. East Indies.
5057. *Hibiscus cannabinus*, Indian hemp, Bastard Jute. East Indies.
5211. *Hibiscus tiliaceus.* (Bark.) China.
5316. *Hibiscus tiliaceus.* Majagua. San Salvador.
5239. Horse Hair. (Braid.) Hawaiian Islands.
5057. Indian Hemp, *Hibiscus cannabinus.* East Indies.
5327. Istle Grass, *Bromelia sylvestris.* Mexico.
Jute. See *Corchorus* sp.
5057. Jute, bastard, *Hibiscus cannabinus.* East Indies.
5245. Kapa Tree. (Portion of Branch.) Hawaiian Islands.
Kapok. See *Eriodendron anfractuosum.*
5335. Karatto Fiber, *Agave Karatto.* Jamaica.
5127. King ma, China Grass; *Sida tiliæfolia.*
5320. Lanilla (?) *Cibotium* sp. (?) San Salvador.
5183. *Lepironia mucronata.* (Mat.) China.

5140. *Linum usitatissimum*, Flax. China.
5167. *Linum usitatissimum*, Flax (Stalks.) Egypt.
5310. *Linum usitatissimum*, Flax. Egypt.
Maguey, *Agave* sp.
5316. Majaguay, *Hibiscus tiliaceus.* San Salvador.
5177. Majagüillo Bark, *Muntingia calabura.* Venezuela.
5230. Manila, Pette eucrius (?). Hayti.
5014. Manila Hemp, *Musa textilis.*
5041. Manila Hemp, *Musa textilis.*
5232. *Mariritia aculeata*, Yta Palm. (Hammock.)
5213. Mauritius Hemp, *Fourcroya gigantea.*
Mescal, *Agave* Sp.
5044. Moorva, Bowstring Hemp, *Sanseviera zeylanica.* East Indies.
5177. *Muntingia calabura*, Majagüillo Bark. Venezuela.
5049. *Musa paradisiaca*, Plantain. (Rope.) India.
5311. *Musa paradisiaca*, Plantain. San Salvador.
5342. *Musa paradisiaca*, Plantain. Jamaica.
5341. *Musa sapientum*, Banana. Jamaica.
5059. *Musa* sp. Central America.
5014. *Musa textilis*, Manila Hemp. (Rope.)
5209. *Odina Wodier.* (Bark.) India.
5037. Oheyo (Ohiyo) Bark. Japan.
5246. Olona, Hemp. Hawaiian Islands.
5008. Palmas, *Washingtonia filifera.* California.
5181. Palmetto, *Chamærops serrulata.* Florida.
5055. Palmit. rope.
5190. *Pandannus* sp. (Shoe.) N. Formosa.
5332. Papelillo. San Salvador.
5016. Pau, Hemp. Siam.
5230. Pette eucrius, Manila. Hayti.
5185. *Phœnix jarinifera.* (Brush.) China.
5019. *Phœnix sylvestris*, Wild Date Palm. India.
5102. *Phrynium dichotomum.* (Mat.) India.
5024. Piassaba, *Attalea funifera.* Brazil.
Pineapple Fiber, or Hemp. See *Ananassa sativa.*
5339. Pinguin Fiber, *Bromelia pinguin.* Jamaica.
5313. Piñula. San Salvador.
Pita. See *Agave* sp. *Fourcroya* sp.
Plantain. See *Musa paradisiaca.*
5321. Pochote, *Bombax ceiba.* San Salvador.
5263. Pochote, *Bombax ceiba.* Guatemala.
5203. *Pollonia eriopoda.* Sattara.
Pulu. See *Cibotium.*
Ramie. See *Bœhmeria; Conocephalus.*
5046. Roselle, *Hibiscus sabdariffa.* East Indies.
5042. *Sanseviera zeylanica* Moorva, Bowstring Hemp. Madras.

5044. *Sanseviera zeylanica* Moorva, Bowstring Hemp. East Indies.
5337. *Sanseviera Guineensis.* Jamaica.
5205. *Saxifraga Virginica.* (Mat.) Kew Gardens.
5047. Seemay Kathalay Fiber, *Fourcroya gigantea.* Madras.
24237. *Sesbania* sp. (Stems.) Arizona.
5206. *Sesbania aculeata* var. *paludosa.* (Mat.) India.
5127. *Sida tiliæfolia*, King Ma. China.
5297. Silk Cotton [?], *Bombax* sp. (?). Mexico.
5221. Silk Cotton, *Eriodendron anfractuosum.* Java.
5336. Silk Grass, *Fourcroya Cubensis.* Jamaica.
5340. Silk Grass, *Bromelia Karatas.* Jamaica.
5104. *Stipa tenacissima*, Esparto. Spain.
5105. *Stipa tenacissima*, Esparto. Spain.
5106. *Stipa tenacissima*, Esparto. Spain.
5229. Straw, wild. (Rope.) Hayti.
5043. Sunn, *Crotolaria juncea.* East Indies.
5102. Sylhet, *Phrynium dichotomum.* (Matting of flower stems.)
5275. Talipot Palm, *Corypha umbraculifera.* (Hat.) Philippine Islands.
5179. Tea-weed Fiber. Mississippi.
5345. Trumpet Bark, *Cecropia peltata.* Jamaica.
5053. *Urena lobata.* East Indies.
5008. *Washingtonia filifira*, Palmas. California.
5270. Willow Twigs. California.
Wool. See special list of wools.
5259. *Xerophyllum tenax*, Grass. Washington Territory.
5232. Yta Palm, *Mariritia aculeata.* Pernambuco.
5343. *Yucca aloifolia.* Jamaica.
5302. *Yucca alata.* California.
21066. *Yucca baccata.* (Fine fiber.) California.
51065. *Yucca baccata.* (Coarse fiber.) California.
5032. *Yucca Whippleyi.* California.

Among the special exhibits illustrating the preparation and uses of vegetable fibers there is a collection of twenty-two specimens of jute, grown in Mississippi, showing the fiber in successive stages of preparation from the unretted bark to the fiber as used in the finer goods. This series was the gift of the Hon. W. W. Stone, of Stoneville, Miss.

The series above-mentioned is well supplemented by another presented by Mr. Appleton Sturgis, of New York, which shows a well-made section of a bale of jute butts from Calcutta, and the stages passed through by the fiber in the manufacture of gunny cloth.

The various uses of the esparto grass are shown in a good series of specimens from Spain, which was exhibited at the Centennial Exhibition in Philadelphia.

The well-known China-grass cloth is well represented in the collections; the number of specimens on exhibition is twenty-seven.

TEXTILE FIBERS DESIRED.

The number of textile fibers in use, or that have been proposed for use, is very large, and the foregoing list by no means includes all of them. The Museum desires to obtain specimens of fibers not named on the list, or specimens of the fibers mentioned from different localities than those now in the collection. It is especially desirable to obtain specimens of the different qualities of the fibers, labeled with their distinguishing commercial names and comparative value. The method of preparation should also be stated, and information should be furnished concerning the production and uses of the different qualities.

COTTON AND COTTON GOODS.

PRELIMINARY LIST OF COTTONS IN THE NATIONAL MUSEUM.

[Grade on American standard.]

5309. Raw cotton. West Indies. (In the boll.)
56093. Raw cotton. West Indies. Good-fair.
56094. Raw cotton. Maceinos, Brazil. Fair.
56095. Raw cotton. Maceinos, Brazil. Good-fair.
56096. Raw cotton. Maranham, Brazil. Fair.
56097. Raw cotton. Maranham, Brazil. Good-fair.
56098. Raw cotton. Pernambuco, Brazil. Fair.
56099. Raw cotton. Pernambuco, Brazil. Good-fair.
56100. Raw cotton. Paraiba, Brazil. Fair.
56101. Raw cotton.
56102. Raw cotton. Peru. Red.
56103. Raw cotton. Peru. Good-fair.
56104. Raw cotton. Peru. Good-fair rough.
56105. Raw cotton. Peru. Good-rough.
56106. Raw cotton. Peru. Fine-rough.
56107. Raw cotton. Peru. Extra-quality rough.
56108. Raw cotton. Peru. Fair-smooth.
56109. Raw cotton. Peru. Good-fair smooth.
56110. Raw cotton. Peru. Good-good smooth.
56160. Raw cotton. Peru. (1882) (unginned.)
56161. Raw cotton. Peru. (1882) (unginned.) Brown.
56111. Raw cotton. Egypt. White-fair.
56112. Raw cotton. Egypt. Good-fair.
56113. Raw cotton. Egypt. White-good.
56114. Raw cotton. Egypt. White-fine.
56115. Raw cotton. Egypt. Brown-fair.
56116. Raw cotton. Egypt. Brown-good.
56117. Raw cotton. Egypt. Brown-fine.
56118. Raw cotton. Egypt. Fair.

56119. Raw cotton. Egypt. Good-fair.
56120. Raw cotton. Egypt Good.
56121. Raw cotton. Egypt. Fair.
56122. Raw cotton. Lagos, Africa.
56123. Raw cotton. Masandaran, Persia.
56124. Raw cotton. Kaukasus, Persia.
56125. Raw cotton. Tashkend, Persia.
56126. Raw cotton. Bucharia, Persia.
56127. Raw cotton. Bengal, India.
56128. Raw cotton. Bengal, India.
56129. Raw cotton. Bengal, India.
56130. Raw cotton. Bengal, India.
56131. Raw cotton. Western India.
56132. Raw cotton. Western India.
56133. Raw cotton. Western India.
56134. Raw cotton. Tinnevelly, India.
56135. Raw cotton. Tinnevelly, India.
56136. Raw cotton. Tinnevelly, India.
56137. Raw cotton. Dhollerah, India. Good.
56138. Raw cotton. Dhollerah, India. Fine.
56139. Raw cotton. Oomrawutee, India. Good-fair.
56140. Raw cotton. Oomrawutee, India. Good.
56141. Raw cotton. Scinde, India. Good-fair.
56142. Raw cotton. Scinde, India. Good.
56143. Raw cotton. India. Good, machine-ginned.
56144. Raw cotton. India. Fine, machine-ginned.
56145. Raw cotton. Rangoon, India. Fair.
56146. Raw cotton. Rangoon, India. Good-fair.
56147. Raw cotton. Coimbatour or Salem, India. Good-fair.
56148. Raw cotton. Hinghenghaut, India. Good.
56149. Raw cotton. Dacca, Bengal, India. Fair.
56150. Raw cotton. Coconada, India. Fair-red.
56151. Raw cotton (saw-ginned). Dharwar, India. Good.
56152. Raw cotton (unginned). Siam.
56153. Raw cotton (unginned). China.
56154. Raw cotton. China. Good-fair.
56155. Raw cotton. China. Good.
56156. Raw cotton. Nanking, China. Good.
56157. Raw cotton. Fiji Islands. Rough-stapled.
56158. Raw cotton. Fiji Islands. Long-stapled.
56162. Raw cotton. Lona Lona, Fiji Islands, "South Sea Island cotton."
56163. Raw cotton. Mango, Fiji Islands.
56159. Raw cotton. Tahiti, Society Islands. Fair.
56171. Raw cotton. Osaka-Fu, Japan. (1882.)
56172. Raw cotton. Osaka-Fu, Japan. (1882.)

56173. Raw cotton. Osaka-Fu, Japan. (1882.)
56174. Raw cotton. Osaka-Fu, Japan. (1882.)
56175. Raw cotton. Miye-ken, Japan. (1882.)
56176. Raw cotton. Miye-ken, Japan. (1882.)
56177. Raw cotton. Aiche-ken, Japan. (1882.)
56178. Raw cotton. Aiche-ken, Japan. (1882.)
56179. Raw cotton. Shidmoka-ken, Japan. (1882.)
56180. Raw cotton. Tamanishi-ken, Japan. (1882.)
56181. Raw cotton. Ibaraki-ken, Japan. (1882.)
56182. Raw cotton. Gipu-ken, Japan. (1882.)
56183. Raw cotton. Nagano-ken, Japan. (1882.)
56184. Raw cotton. Fukui-ken, Japan. (1882.)
56185. Raw cotton. Shimane-ken, Japan. (1882.)
56186. Raw cotton. Okayama-ken, Japan. (1882.)
56187. Raw cotton. Tamaguchi-ken, Japan. (1882.)
56188. Raw cotton. Kumamoto-ken, Japan. (1882.)
Raw cotton. Portugal. A large collection of specimens not yet catalogued.
5349. Raw cotton. Ozier silk cotton, Mississippi.
5384. Raw cotton. Anatolia, Turkey.
5385. Raw cotton. Anatolia, Turkey.
5387. Raw cotton. Macedonia.
5388. Raw cotton. Macedonia (from American seed).
5389. Raw cotton. Japan.
5390. Raw cotton. La Tinto, Guatemala.
5391. Raw cotton. Coban, Guatemala.
5264. Raw cotton. Guatemala.
5298. Raw cotton. Siam.
5223. Raw cotton. Siam.
5248. Raw cotton. Hawaiian Islands.
5295. Raw cotton. Persia (unginned).
5296. Raw cotton. Persia (ginned).

The manufacture of cotton goods in the United States is well represented by a very large assortment of finished goods, from different factories, the list of which is not ready for publication. It may be said, in a general way, that this assortment includes fabrics from the following mills, among others, viz: Foulards from the Cocheco Manufacturing Company, Dover, N. H.; shirtings, sheetings, ginghams, and other goods from Powhatan Mills, Putnam, Conn.; Lancaster Mills, Clinton, Mass.; Utica Steam Cotton Mills, Lonsdale Mills, Rhode Island; Greenwoods Company, New Hartford, Conn.; Slater Cotton Company, Pawtucket, R. I.; Langdon Manufacturing Company, Manchester, N. H.; "Pequots" from Naumkeag Steam Cotton Company, Salem, Mass.; "Anchor" goods from Dwight Manufacturing Company, Chicopee, Mass.; "Rochdale" goods from Nightingale Mills, Putnam, Conn., and cotton flannels from the Massachusetts Cotton Mills, Lowell, Mass.

Among cotton goods of foreign manufacture a very large and exceptionally fine assortment from Japan and China deserves especial mention; also a good series from Siam. Besides these there is a large number of samples of cotton yarns and finished goods collected by the United States consuls in all parts of the world, received from the Department of State.

COTTON FABRICS DESIRED.

A series of specimens which, with descriptive labels and drawings or photographs of machinery, will afford a clear idea of the process of manufacture of cotton goods of various kinds is particularly desired. There are also some special manufactures required to perfect the collection, which it is hoped will soon be obtained from the manufacturers.

WOOL AND WOOLEN FABRICS.

PRELIMINARY LIST OF SPECIMENS OF WOOL IN THE NATIONAL MUSEUM.

5247. Wool. Hawaii.
5279. Wool. Guatemala.
5253. Wool. Guatemala.
5392. Wool. Greasy, ¼-bred. 13⅜*d.* per pound.* New Zealand.
5393. Wool. Clothing, merino. 10½*d.* per pound. New Zealand.
5394. Wool. Merino. 11⅛*d.* per pound. New Zealand.
5395. Wool. Greasy, merino. 11½*d.* per pound. New Zealand.
5396. Wool. Merino. 11½*d.* per pound. New Zealand.
5397. Wool. Merino. 12⅛*d.* per pound. New Zealand.
5398. Wool. Merino wethers in grease. 9*d.* per pound. New Zealand, N. Is.
5399. Wool. 10½*d.* per pound. New Zealand.
5400. Wool. Three-fourth-bred Leicester. 9½*d.* to 10*d.* per pound. New Zealand.
5401. Wool. Merino. 10*d.* per pound. New Zealand.
5402. Wool. Scoured Leicester. 1*s.* 4*d.* per pound. New Zealand.
5403. Wool. Combing. 10⅜*d.* per pound. New Zealand.
5404. Wool. Three-fourths-bred Leicester. 8½*d.* per pound. New Zealand.
5405. Wool. Washed merino. 21*d.* per pound. New Zealand.
5406. Wool. Greasy merino. 11*d.* per pound. New Zealand.
5407. Wool. Half-bred greasy. 8½*d.* per pound. New Zealand.
5408. Wool. Half-bred Leicester. 9½*d.* per pound. New Zealand.
5409. Wool. Merino. 1*s.* 2*d.* per pound. New Zealand.
5410. Wool. Coop-bred lamb's in the grease. 7½*d.* per pound. New Zealand.
5411. Wool. Merino. 10½*d.* per pound. New Zealand.

* The prices quoted in this list are the prices at which the wools were sold in the countries named, November 22, 1880.

5412. Wool. Cross-bred in the grease. 8*d*. per pound. New Zealand, N. Is.
5413. Wool. Lincoln lamb's in the grease. 8*d*. per pound. New Zealand.
5414. Wool. Greasy Leicester. 9*d*. per pound. New Zealand.
5415. Wool. Lincoln in the grease. 8½*d*. per pound. New Zealand.
5416. Wool. Combing. 11*d*. per pound. Sydney, Australia.
5417. Wool. Merino combing, greasy. 9½*d*. per pound. Victoria, Australia.
5418. Wool. Half-bred merino, greasy. 9½*d*. per pound. Victoria, Australia.
5419. Wool. Merino clothing, scoured. 1*s*. 1*d*. per pound. Victoria, Australia.
5420. Wool. Merino clothing, scoured. 1*s*. 3*d*. per pound. Victoria, Australia.
5421. Wool. Merino clothing, washed. 1*s*. 1*d*. per pound. Victoria, Australia.
5422. Wool. Cross-bred, first combing. 14*d*. per pound. Victoria, Australia.
5423. Wool. Washed, three-fourths bred. 1*s*. per pound. New Zealand.

In addition to the above there are numerous samples of wool from Portugal not yet catalogued.

WOOL FABRICS.

Among manufactured wool goods the American products are not well represented in the Museum. There are a few articles, however, among which may be mentioned some fine specimens of knit goods from the New Britain Knitting Company.

There are some felt rugs from China, and a particularly valuable series of specimens from Tasmania illustrating the process of manufacturing felt hats. A good set of samples of English woolen fabrics is also in the Museum, recently received from Mr. Robertson, of Messrs. Hitchcock, Williams & Co., London.

SILK AND SILK FABRICS.

PRELIMINARY LIST OF RAW SILKS AND SILK THREADS IN THE NATIONAL MUSEUM.

5039. Silk thread. Portugal.
5040. Silk thread. Sewing-machine thread. Portugal.
5070. Raw silk. Singles. Portugal.
5071. Raw silk. Singles. Portugal.
5072. Raw silk. Singles. Portugal.

5073. Raw silk. Singles. Portugal.
5090. Raw silk $\frac{12}{13}$. Portugal.
5091. Raw silk $\frac{12}{14}$. Portugal.
5092. Raw silk $\frac{14}{16}$. Portugal.
5093. Tram silk $\frac{18}{20}$. Portugal.
5094. Tram silk $\frac{20}{22}$. Portugal.
5095. Tram silk $\frac{24}{26}$. Portugal.
5096. Tram silk $\frac{26}{28}$. Portugal.
5097. Raw yellow silk. Chang Chow, China.
5098. Raw yellow silk. Chang Chow, China.
5099. Raw yellow silk. Chang Chow, China.
5100. Raw white silk. Chang Chow, China.
72748. Raw silk. United States.

SILK FABRICS.

There is very little material in the Museum illustrative of American silk manufacture. An article of historic interest is the first flag made of American silk, which was recently placed in the Museum by order of Congress.

Mr. Robertson, of London, some of whose donations have been mentioned elsewhere, has presented the following specimens of fine silk goods from England:

No.	Description.	Width.	Price.		Place of production.
		Inches.	*s.*	*d.*	
5476	Satin, Pekin	23	4	11½	Manchester.
5477	Tassore	22		18¾	Bradford.
5478	Spun check	22		23¾	Do.
5479	....do	22		23¾	Do.
5480	Gros grain	23	3	6½	Manchester.
5481	Gros d'Londres	24	6	9	Do.
5482	Check glacé	22	2	6¾	Do.
5483	Gros de pays	21		23¾	Bradford.
5484	Shot gros grain	23	4	6½	Manchester.
5485	Ottoman	24	5	11	Do.
5486	Satinet	22	5	3	Do.
5487	Shot rhadamas	23	3	4½	Do.
5488	Broche	23	3	11½	Do.
5489	Camayeans and broche Ottoman	23	6	3	Do.
5490	Schappe velvet	18	3	11½	Bradford.
5491	Glacé, Pekin	24	5	6	Manchester.
5492	Dress plush	24	5	11	Bradford.
5493	Shot taffettas	23	4	6	Manchester.
5494	Moire antique	32	10	6	London.
5495	Sarsnet	19		18½	Manchester.
5496	Plush	20	5	11	Bradford.
5497	Spun check	21		15¾	Manchester.

There are also twenty-six fine specimens of plain and figured silks from Lisbon, manufactured by the Fabrica Nacional de Fiaco e Tecidos de Seda, and about fifty specimens of silks from Japan, collected by the United States exploring expedition under the command of Commodore Perry, with some rich silk robes and shawls from Japan.

LACES.

There are sixteen frames illustrating the process of manufacturing machine-made silk laces of various kinds, beginning with the silk as received from the throwsters and showing the laces as they appear at different stages of manufacture. These include Spanish, escurial, Portland, purl, point coraline, and other laces; also lace mitts, lace scarfs, purl lace nubias, and hair nets. This valuable collection was the gift of Messrs. A. G. Jennings & Sons, of New York.

The following specimens of English laces were presented by Mr. A. Robertson, of Messrs. Hitchcock, Williams & Co., Saint Paul's Church Yard, London:

No.	Description.	Price.		Place of production.
		s.	*d.*	
5355	Real English thread, per yard	4	0	Northamptonshire, England.
5356	Dentelle guipure, do	8	6	Nottingham, England.
5357	Dentelle Malines, do	11	6	Do.
5358	Dentelle Valenciennes (27 inches wide), do	3	11	Do.
5359	Dentelle Valenciennes, per dozen	8	3	Do.
5360	Duchesse, do	14	6	Do.
5361	Real honiton, per yard	27	0	Devonshire, England.
5362	do, do	18	9	Do.
5363	do, do	22	0	Do.
5364	do, do	10	11	Do.
5365	do, do	5	11	Do.
5366	do, do	15	6	Do.
5367	do, do	4	0	Do.
5368	Madras point, per dozen	13	6	Nottingham, England.
5369	Madras point, do	14	9	Do.
5370	Real white Maltese, per yard	3	0	Buckinghamshire, England.
5371	Point d' alençon, per dozen	9	6	Nottingham, England.
5372	Point gauze, do	28	6	Do.
5373	Point gauze, do	28	6	Do.
5374	Point mirecourt, do	6	9	Do.
5375	Valenciennes alençon, do	12	6	Do.
5376	Valenciennes antique, do	7	6	Do.
5377	do, do	7	6	Do.
5378	do (27 inches wide), per yard	3	9	Do.
5379	Black silk guipure, Spanish, per dozen	13	6	Do.
5380	do, do	21	0	Do.
5381	do, do	23	0	Do.
5382	do, do	24	0	Do.
5383	Black silk combination guipure, Spanish and Chantilly, per dozen	17	6	Do.

In addition there is a collection of more than fifty large and beautiful specimens of linen laces manufactured at Vianna do Castello, received from the Portuguese Government, which are not yet catalogued.

SPECIMENS OF LACES DESIRED.

It is particularly desired to make the lace collection of historical and artistic value. To this end those who possess specimens of laces, especially of old hand-made laces, even though only small pieces, can contribute toward the perfection of the collection if they will part with them, and in some cases, no doubt, specimens thus presented will prove to be of especial value. In every case the history of the pieces sent should be given so far as it may be known.

PAPER AND PAPER STOCK.

Some specimens illustrating the manufacture of paper from wood have been promised by a leading manufacturer, but have not yet been received. Apart from these, the paper manufacture of this country is not represented in the collections.

Foreign manufactures are better represented. There are many kinds of paper from Spain, Egypt, China, and Japan, which are of great interest.

Papers of American manufacture accompanied by specimens of the materials from which they are made, showing the materials in process of manufacture, are desired.

SPINNING AND WEAVING MACHINERY.

While it is not the policy of the National Museum to become a depository of mechanical appliances generally, there are certain kinds of machinery that it is desirable to show in connection with the textile industries. Whatever relates to the old methods of spinning and weaving by hand, when homespun garments were the staple articles of clothing, becomes of interest, whether it be the goods themselves, or the machinery with which they were produced.

There are now in the Museum various old appliances for spinning yarn; some primitive devices used by the Indians, others more familiar, which were in use in civilized countries scarcely a generation ago.

Among the machinery for weaving there is an old loom from Maine, which was used for the manufacture of linen cloth, presented by Mr. S. A. Kilbourne, of Morrisania, N. Y., and another from Pennsylvania, collected by Dr. T. H. Bean, probably constructed about the year 1819, which was used until quite recently in the manufacture of rag-carpets. A Siamese loom of primitive construction is also shown, and some models of hand looms. There is also a miniature representation of the process of weaving in China, the work of native artists.

A very primitive method of weaving is shown in one of the cases in which there is an Indian blanket partly woven, the warp hanging vertically, stretched between two poles.

The collection of spinning and weaving machinery is not complete, and additions of perfect apparatus are desired. Persons having such apparatus which they desire to have preserved in the Museum, are requested to forward brief descriptions of what they have. In this way the preservation of many articles of historic interest, which are being rapidly lost and destroyed, will be insured.

This hastily-prepared account of the textile collection in the National Museum gives but a very inadequate idea of the rich store of material which has been accumulating for years, more rapidly than it could be properly cared for and installed by the staff of officers and assistants

heretofore available for museum work. Many valuable specimens and collections have been left unnoticed because they have not yet been studied or classified. Thus there are specimens of primitive weaving, and a particularly interesting collection of tapas from various localities, which will be prepared for the exhibition at New Orleans. This department of the Museum has only recently been placed in charge of a curator, and the material is now being arranged for exhibition as rapidly as possible. Under the present conditions it is possible not only to work up the old material, but at the same time to care for, install, and label, all new specimens promptly after they are received.

It is the intention of the Museum to make the collection of textile fibers and fabrics adequately represent the textile resources and industries of the country, as becomes a national institution.

CONTRIBUTIONS AND THEIR ACKNOWLEDGMENT.

No money having at any time been specially appropriated for increasing the collections by purchase, the growth of the Museum has ever been and still is dependent solely upon the exertions of its officers and those of other branches of the public service and upon the public spirit and liberality of its friends.

The friends of the Smithsonian Institution and the National Museum are earnestly invited to take part in the work of building up the collections and in particular to respond to special requests for advice or other aid which may reach them by letter.

The following rules for the acknowledgment of specimens will be adhered to:

1. Each contribution will be recognized by a formal written acknowledgment from the director.

2. Each contribution will be published in the annual reports of the Smithsonian Institution and the National Museum; and in the catalogues and other publications of these establishments in which the objects contributed may be alluded to, the name of the contributor will always be given.

3. On the label, which is invariably attached to every object, the name of the contributor will be conspicuously printed. In the case of donations the form will be "Gift of ——— ———," and where the objects have been obtained by special exertions of a friend of the Museum, who, however, is not their donor, the form will be "Obtained by ——— ———," or "Collected by ——— ———."

4. Objects which may have been bought by special appropriations, such as those for the Philadelphia and Berlin exhibitions, will not be labeled with the name of the persons from whom purchased, except by special agreement in cases where these persons have been only in part paid for their exertions.

5. The Museum will make every possible return for aid rendered, by offering in exchange its publications and its duplicate specimens.

LABELING.

Each object, or group of objects, will be accompanied by a large plainly-printed label, which will give a concise description of what is shown, an account of its origin and uses, a synopsis of its history, and the name of the person or organization contributing it to the Museum. The character of the Museum is such that any labels which might suggest advertising for business purposes must be excluded. It will be the policy of the Museum, however, to give prominence on each label to the name of the person or business house from whom it has been received, provided that the object is a gift to the Museum.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 25.

PRELIMINARY PLAN FOR A COLLECTION OF THE BUILDING AND ORNAMENTAL STONES AND ROCKS OF THE UNITED STATES, TO BE EXHIBITED AT THE WORD'S INDUSTRIAL AND COTTON CENTENNIAL EXPOSITION OF 1884–1885, AT NEW ORLEANS.

By GEORGE P. MERRILL,
Curator of lithology and physical geology.

1. BUILDING AND ORNAMENTAL STONES.

   (*a.*) A collection showing all grades and varieties of building and ornamental stones quarried in the United States; this to be accompanied by a hand-book containing a brief description of each variety of stone and its mineral composition; also tables of statistics relative to the amount and value of the quarry products and capital invested.

   (*b.*) A series of maps showing by means of variously-colored dots the locations of all the quarries in the United States, and the kinds of stone there found.

2. ILLUSTRATIONS OF STONE BUILDINGS.

   A series of photographs of stone buildings colored to represent the natural color of the stone of which each is constructed.

3. ROCK-FORMING MINERALS.

   A collection of all the varieties of minerals usually constituting rock masses, properly grouped and labeled, giving the name, crystalline system, and chemical composition of each, together with the names of the rock or rocks in which each occurs.

4. ROCK COLLECTION.

   A collection of hand-specimens of rocks in sizes of about 3 inches by 4 inches by 1 inch, comprising all the principal varieties known to lithologists.

5. ILLUSTRATIONS OF ROCK STRUCTURE.

(*a.*) Macroscopic. By means of specimens. A series of rocks showing all typical forms of structure, as (1) vitreous or glassy; (2) hornlike or flinty; (3) felsitic; (4) granular (clastic); (5) crystalline granular; (6) aphanitic; (7) porphyritic; (8) massive; (9) stratified; (10) schistose or foliated; (11) fibrous; (12) porous or cavernous; (13) cellular; (*a*) vesicular, (*b*) pumiceous; (*c*) scoriaceous; (14) amygdaloidal; (15) spherulitic; (16) oolitic; (17) pisolitic; (18) concretionary; (19) conglomerated; (20) brecciated.

(*b.*) Microscopic. By means of enlarged photographs and drawings. A series of colored photomicrographs or hand drawings, showing the structure of some of the more common rock types as revealed by the microscope. The illustration in all cases to be accompanied by the thin section from which it was prepared.

WASHINGTON, *July* 21, 1884.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 26.

PLAN FOR A COLLECTION OF GEMS AND PRECIOUS STONES, TO BE EXHIBITED AT THE CINCINNATI INDUSTRIAL EXPOSITION AND THE WORLD'S INDUSTRIAL AND COTTON CENTENNIAL EXPOSITION OF 1884-1885, AT NEW ORLEANS.

By F. W. CLARKE,
Curator, Department of Minerals.

The Department of Mineralogy in the United States National Museum will exhibit a series of ornamental and precious stones, both cut and rough, with the object of illustrating the resources of the United States in that peculiarly interesting direction. A fair amount of foreign material will be included for purposes of comparison; and, for educational reasons, an effort will be made to show each species in as many varieties as possible. The following minerals are included in the plan, full species being italicized.

Diamond: Colorless, yellow, green, blue, pink. Bort. Carbonado.

Corundum: Massive and crystalized, all colors. Ruby. Sapphire. Asteria. Oriental topaz, amethyst, and emerald.

Spinel: Balas ruby, &c.

Chrysoberyl: Alexandrite.

Rutile, Hematite.

Quartz: Rock crystal. Amethyst. Rose, yellow, smoky, blue, green, ferruginous, milky, and aventurine quartz. Gold in quartz. Sagenitic quartz. Cat's-eye. "Crocidolite."

Chalcedony. Carnelian. Onyx. Sardonyx. Chrysoprase. Heliotrope. Jasper. Agate. Moss-agate. Flint. Cameos and intaglios.

Opal: Precious opal. Fire opal. Common opal. Queensland opal. Cacholong. Hyalite. Opalized wood.

Fluor spar: Massive and crystallized.

Beryl: White, yellow, green, blue. Aquamarine. Emerald.

Topaz: White, yellow, pink, blue.

Garnet: Pyrope. Almandine. Essonite. Carbuncle. Grossularite. Ouvarovite.

Tourmaline: Green, white, yellow, blue, brown, black. Rubellite.
Spodumene: Violet. Yellow. Hiddenite.
Chrysolite.
Zircon: Hyacinth.
Iolite. Idocrase. Andalusite.
Diopside. Dioptase. Euclase. Phenakite. Epidote.
Axinite. Moldavite. Sphene.
Feldspar group. Labradorite: Sunstone. Moonstone. Amazon stone.
Prehnite: Chlorastrolite.
Thomsonite.
Lapis lazuli. Chrysocolla. Rhodonite. Serpentine.
Jadeite. Nephrite. Pipestone. Meerschaum.
Malachite.
Turquoise.
Smithsonite.
Calcite: Satin spar. Mexican onyx.
Alabaster.
Jet. Cannel coal.
Amber, &c.

Contributions, either gifts or loans, may be sent addressed to the Department of Mineralogy, United States National Museum, Washington. They should be securely packed and carefully labeled, and should arrive as early as November 1, 1884. The foregoing classification is only for suggestions, and does not exclude any mineral not specifically named therein which might possess ornamental or gem value.

WASHINGTON, *August* 1, 1884.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 27.

DIRECTIONS FOR COLLECTING, PRESERVING, AND TRANSPORTING TORTRICIDS AND OTHER SMALL MOTHS.

By C. H. FERNALD.

COLLECTING APPARATUS.

1. A common insect-net of swiss muslin on a stout wire hoop about 1 foot in diameter, secured to a light pole 5 or 6 feet long and about 1 inch in diameter at the larger end. The net should be from 20 to 24 inches deep, and made with a rounded bottom, so that there shall be no close corners into which the insects can crawl and rub off the scales from their wings.

2. A supply of pasteboard pill-boxes 1 inch in diameter and five-eighths of an inch deep. Each one should have a pin-hole in the middle of the cover. These boxes should be lined on the inside with unglazed paper, so that the living insects may hold on by their feet, and not be rolled about and denuded of their scaly covering.

PRESERVING APPARATUS.

1. Cork-lined storing boxes of well-seasoned wood for preserving the insects after they are captured and pinned. These may be of any convenient size, but the cork must be firmly secured, and the insects must be firmly pinned to the cork, so that they can by no possible chance become loosened or detached.

2. Insect pins of several sizes, adapted to the different sizes of the insects captured. The black or japanned pins are far preferable, since they do not corrode, and thus destroy the specimens. Small silver or gilt pins are desirable for the smallest species.

3. A bottle of chloroform and a camel's hair brush to use in killing the insects.

4. A piece of dry corn-pith, or some similar soft material, to rest the insect upon when pinning it.

5. A pair of *fine* brass forceps to handle the insects with, for they should *never* be touched with the fingers.

6. A pair of pinning forceps for setting the pins into the cork after the insects are pinned.

WHEN, WHERE, AND HOW TO COLLECT.

Tortricids are most abundant from early spring to late in the fall about shrubbery, in the open fields, or along the edges of woods; not generally abundant in dense forests. As some one species feeds on nearly every plant, shrub, or tree, the chances are most promising where there is the greatest variety of vegetation. In temperate latitudes they fly mostly during the latter part of warm days—some species even into the night—but they may be "flushed" during any part of the day, if it is warm and the sun shining, when they fly but a short distance before they alight. If the wind is blowing, it is well to walk against it, so that the insects on being started up will fly into the wind, and be more easily overtaken and captured in the net. When one is taken in the net it can be covered with a pill-box, and the cover carefully put on so as not to injure the insect, which will cling to the side of the box without attempting to fly until the collector has time to return to his headquarters. One will soon acquire skill in boxing these insects without injuring them.

After returning, or at the end of the day, the captures should be killed and pinned. This may be done by putting the boxes containing the insects on the table, and dipping the camel's hair brush into the chloroform, and touching it upon the pin-hole in the pill-boxes, ten or more at a time. In a few seconds the insects will be dead, save the larger ones, upon which this treatment may have to be repeated. The boxes may now be opened, one at a time, and the insect turned out upon the table; then it may be taken up with the brass forceps in the right hand and laid, with its back up, in a slight groove in the corn-pith which is held in the left hand. Take a pin of suitable size in the thumb and forefinger of the right hand and insert the point in the middle of the thorax, on the upper side, and push it carefully and squarely down through the insect. Great care should be taken that the pin may not go down through *obliquely*, and, also, if there are tufts of scales on the thorax that they may not be removed by the pin. If, however, this should occur, mention should be made of it in the notes and the position of the tuft indicated.

About one-fourth of the pin should remain above the insect, and all should be of uniform height upon the pins. When, however, the *short English* pins are used the insect should be in the middle of the pin.

After all the insects are pinned and put in the storing boxes a few drops of chloroform should be dropped into the boxes before they are closed, to prevent any of the insects from coming to life again.

Each specimen should have a label, with number on the pin, referring to a book, where all possible information as to the exact time, place, and mode of capture should be carefully noted.

When collections are to be sent away they may be carefully pinned in a storing box, each specimen with its own special number on the pin referring to a corresponding number on the label, where all information as to date of capture, locality, etc., is noted, to be sent with the box, and the whole packed in a larger box with an inch of space at least all around, and this space filled in loosely with cotton, soft grass, excelsior, or other soft material to take the jar in transit, and to prevent the insects from breakage.

Small lots may be safely and cheaply sent by mail, if packed in the following manner: Take a pasteboard box of suitable size, and sew cork carefully and firmly to the bottom, then pin the insects into this box with only numbers on the labels—no writing; pack this in a larger wooden box of sufficient strength that it cannot be crushed in the mails; pack cotton loosely in the outer box, all around the inner one, and wrap the whole in paper, and tie up with strong twine, and direct to go by mail.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 28.

DIRECTIONS FOR MOUND EXPLORATION.

By CYRUS THOMAS, Ph. D.

The first step in all cases should be to make as accurate a plat or plan of the entire group of works as possible, showing the positions of the mounds, excavations, and other works in reference to each other. Accurate measurements and distances should be given where this is possible; where this is impracticable pacing may be resorted to. If there are mounds differing in form from the ordinary conical tumuli it is best to draw separate figures of these, showing the plan of the base and also of the vertical section. The only measurements of the ordinary rounded or conical mounds necessary are the height at the apex and the diameter or circumference at the base. When they are pyramidal or of unusual form the length and width should be given, or such measurements as will convey a correct idea of the form and size. If truncated, the length and width of the top as well as of the base should be noted, also the height. Similar measurements should be made of all appendages and terraces. It is best to draw on paper, from sight, a plan of the mound or other earthwork and mark the measurements on it, being careful to draw it as it is. A theoretical figure of its supposed original form may be given separately, but it should be distinctly marked as such.

The surroundings and the topography should be carefully noted; for example, whether on upland or lowland, on bluff, ridge, or bottom; whether near to or distant from a stream; whether on the lower terrace, and whether subject to overflow.

It is desirable to obtain as exact plans and measurements as possible of the inclosures in the groups explored, as also of those which have been heretofore described and figured.

In digging a mound not exceeding 15 or 18 feet in height, the best plan is to commence at the margin and run a trench (never less than 5 feet wide) directly through it, or at least beyond the middle, going down to the original surface; then dig another trench from some other quarter to the center, enlarging the opening in the center until a full knowledge of the character of the mound and its contents is gained.

By making thorough examination as the work progresses, and throwing the dirt behind in the trenches the mound can readily be restored to its original form, which should in all cases be done. Careful notice should be taken of the character and thickness of the different strata and a vertical section of the mound drawn, from actual observation, showing the stratification. Notes should be made, on the spot, of every article found in the mound, the depth at which each is found and its position in relation to the others. If skeletons are found their position should be noted, whether lying down or sitting up, stretched out or folded up, and whether on the face, side, or back. Careful examination should be made to see if there is anything to indicate whether the flesh had been removed before burial or not. The skulls and tibiæ should be preserved where this is possible, and also all bones bearing marks of disease or of injury during life, or presenting any marked peculiarity.

All animal bones as well as any vestiges of art should be carefully removed and preserved. If any pottery is found the explorer should be particular to save all the pieces, even to the smallest, as it may be possible to restore the vessels.

If the mound is of considerable height the trenches and pits should be sloped outwards at the sides, to prevent caving. If it is too high for trenching and does not exceed 25 feet, the easiest and best method of exploring it is to sink a circular pit in the center to the depth of about 8 feet, then run a trench from this to the outside of the mound, then carry the pit down 8 feet farther, and next dig an offset or step in the trench about 8 feet down. These steps will afford means of throwing out the dirt without resorting to the use of a windlass and bucket. By making the pit about 12 feet in diameter at the top and sloping it inward, a curb will be unnecessary; still it is well to have a few cross-braces at the weakest points.

Where beds of burnt clay are found in mounds they should be carefully traced before being broken up, and their exact form and size ascertained, and if ashes or charcoals are immediately above or below them, this fact should be noted. In examining inclosures trenches should be cut across them at several points in order to ascertain whether there are any indications of a palisade, and if there is a layer of clay, burnt or unburnt, or of ashes or charcoal, this fact should be mentioned.

Cross-sections, especially where there are ditches in connection with inclosures, aid very greatly in conveying a correct idea of the works.

When examining the small circular depressions known as "house sites," a pit should be sunk in the center 2 or 3 feet below the original surface, as children were sometimes buried in such places.

In explorations of ordinary burial mounds in the northern sections, care should be taken to distinguish between intrusive and primary burials. When no burial mound is found in a group, or when there is one which seems to be inadequate to the probable population, careful search should be made in the vicinity for a cemetery. The character

and position of the graves should be observed, and where the bodies have been placed in stone graves or cists, this fact, and the form and mode of constructing them, should be mentioned.

One common error in opening mounds is to leave them before they have been thoroughly explored; they should not be abandoned until their contents and mode of construction are fully ascertained.

The explorer should note carefully everything that may bear upon the object in view in building, and the use of the mounds and other works, or upon the habits and customs of the people who erected them. Nothing should be taken for granted because it has been published, but each explorer should examine for himself and give his own views regardless of the opinions heretofore given to the world.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 29.

PROVISIONAL PLAN FOR A COLLECTION OF MAMMALS TO BE EXHIBITED AT THE WORLD'S INDUSTRIAL AND COTTON CENTENNIAL EXPOSITION OF 1884-'85, AT NEW ORLEANS.

By FREDERICK W. TRUE,
Curator of the Department of Mammals.

The Mammals to be exhibited may be divided into three groups:

I. A series representing all North American species.

II. Representatives of economic species occurring in all parts of the globe.

III. A series representing the existing orders and suborders into which the class Mammalia is divided.

I.—NORTH AMERICAN SPECIES.

It is intended that this series shall include every species of Mammal inhabiting the American continent north of the Isthmus of Panama. The names and distribution of the species will be found in the provisional list appended. The great majority are already represented in the collections of the Museum, but some are still among its desiderata. The species will be represented:

a. By mounted skins.
b. By models.
c. By drawings.
d. By skeletons.

II.—ECONOMIC SPECIES OCCURRING IN ALL PARTS OF THE GLOBE.

This series will be represented in the same manner as Series II, and arranged either with that series or in connection with the collection of animal products.

a. Species employed as draught-animals and aiding in other ways in the pursuits of men.

b. Species used for food.
c. Species employed in medicine.
d. Species which furnish products to the industries and arts.

III.—THE ORDERS AND SUBORDERS OF EXISTING MAMMALS.

The following orders and suborders are recognized:

Order MONOTREMATA. Monotremes.
Order MARSUPIALIA. Marsupials.
Order EDENTATA. Edentates.
Suborder PILOSA. The Sloths and Anteaters.
Suborder LORICATA. The Armadilloes.
Suborder SQUAMATA. The Pangolins.
Suborder TUBULIDENTATA. The Aard Varks.
Order SIRENIA. Sea-cows.
Order CETACEA. Cetaceans.
Suborder MYSTACOCETI. The Baleen-whales.
Suborder ODONTOCETI. The Toothed-whales.
Order UNGULATA. Ungulates.
Suborder ARTIODACTYLA. The Even-toed Ungulates.
Suborder PERISSODACTYLA. The Odd-toed Ungulates.
Suborder HYRACOIDEA. The Conies.
Suborder PROBOSCIDEA. The Elephants.
Order RODENTIA. Rodents.
Suborder SIMPLICIDENTATA. The Squirrels.
Suborder DUPLICIDENTATA. The Hares.
Order CHIROPTERA. Bats.
Suborder MEGACHIROPTERA. The Fruit-eating Bats.
Suborder MICROCHIROPTERA. The Typical Bats.
Order INSECTIVORA. Insectivores.
Suborder DERMOPTERA. The Flying-cats.
Suborder INSECTIVORA-VERA. The Typical Insectivores.
Order CARNIVORA. Flesh-eaters.
Suborder PINNIPEDIA. The Sea-lions and Seals.
Suborder FISSIPEDIA. The Terrestrial Carnivores.
Order PRIMATES. Primates.
Suborder LEMUROIDEA. The Lemurs.
Suborder ANTHROPOIDEA. Monkeys and Man.

These orders and suborders will be represented by colored illustrations of typical species.

A PROVISIONAL LIST OF THE MAMMALS OF NORTH AND CENTRAL AMERICA, AND THE WEST INDIAN ISLANDS.

By FREDERICK W. TRUE.
Curator of the Department of Mammals.

Class MAMMALIA. Mammals.

Subclass DIDELPHIA.

Order MARSUPIALIA. Marsupials.

Family DIDELPHIDÆ. The Opossums.

Chironectes variegatus, Illiger. Water Opossum.
Guatemala to Brazil.

Didelphys murinus, Linné. Murine Opossum.
Mexico to Brazil.

Didelphys Derbianus, Waterhouse. Derby's Opossum.
Nicaragua to Peru.

Didelphys cinerea, Temminck. Ashy Opossum.
Costa Rica to Brazil.

Didelphys quica, Temminck. Quica Opossum.
Mexico to Brazil.

Didelphys aurita, Max. zu Wied. Azara's Opossum.
Costa Rica to Uruguay.

Didelphys virginiana, Kerr. Common Opossum.
United States to Guatemala.

Subclass MONODELPHIA.

Order EDENTATA. Edentates.

Suborder PILOSA.

Family BRADYPODIDÆ. The Sloths.

Cycloturas didactylus, (Linné) Alston. Unau or Two-toed Sloth.
Guatemala to Northern Brazil and Peru.

Cholopus Hoffmani, Peters. Hoffman's Sloth.
Costa Rica to Ecuador.

Bradypus infuscatus, Wagler.
Panama to Peru and Brazil.

Bradypus castaneiceps, (Gray) Alston. Chestnut-headed Sloth.
Nicaragua.

Family MYRMECOPHAGIDÆ. The Anteaters.

Myrmecophaga quadridactyla, Tamandua-Anteater.
Mexico to Paraguay.

Myrmecophaga jubata, Linné. Ant-bear.
Guatemala to Paraguay.

Suborder LORICATA.

Family DASYPODIDÆ. The Armadilloes.

Tatusia novem-cinctus, (Linné) Alston. Armadillo.
Texas to Paraguay.

Order SIRENIA. Sea-cows.

Family TRICHECHIDÆ. The Manatees.

Trichechus manatus, Linné. South American Manatee.
Texas to Brazil.

Trichechus latirostris, (Harlan) True. Florida Manatee.
Florida.

Order CETACEA. Cetaceans.

Suborder DENTICETE. Toothed Whales.

Family DELPHINIDÆ. The Dolphins.

Sotalia pallida, Gervais.
Florida. (?)

? Steno fuscus, Gray.
Cuba.

Steno compressus, Gray.
Gulf of Mexico. (?)

Delphinus Bairdii, Dall. Baird's Dolphin.
Coast of California.

Delphinus delphis, Linné. Common Dolphin.
Atlantic Ocean.

Delphinus janira, Gray. The Janira.
Newfoundland (Gray).

?Prodelphinus euphrosyne, (Gray) True.
North Atlantic Ocean.

Leucorhamphus borealis, (Peale) Gill. Right-whale Porpoise.
Pacific Coast of North America.

Lagenorhynchus acutus, Gray. Eschricht's Dolphin.
North Atlantic Ocean.

Lagenorhynchus albirostris, Gray. White-beaked Bottlenose.
North Atlantic Ocean.

Lagenorhynchus obliquidens, Gill. Striped or common Dolphin.
Pacific coast of the United States.

Lagenorhynchus thicolea, Gray.
West coast of North America.

Lagenorhynchus gubernator, Cope. Skunk Porpoise.
Coast of New England.

Lagenorhynchus perspicillatus, Cope.
Atlantic coast of the United States.

Tursiops tursio, (Bonnaterre) Van Ben. & Gervais. Bottle-nosed Dolphin.
North Atlantic Ocean.

Tursiops Gillii, Dall. Cowfish.
Pacific coast of the United States.

Tursiops erebennus, (Cope) Gill. Black Dolphin.
Atlantic coast of the United States.

Orca gladiator, (Bonnaterre) Gray. Atlantic Killer.
Atlantic Ocean.

Orca atra, Cope. Pacific Killer.
Pacific coast of North America.

Orca pacifica, (Gray).
North Pacific Ocean. (?)

Globiocephalus melas, (Traill). Blackfish.
North Atlantic Ocean.

Globiocephalus brachypterus, Cope. Short-finned Blackfish.
Coast of New Jersey.

Globiocephalus Scammoni, (Cope). Scammon's Blackfish.
Pacific coast of North America and southwards.

Grampus griseus, (Cuvier) Gray. Grampus.
North Atlantic Ocean.

Grampus Stearnsii, Dall. Mottled or White-headed Grampus.
Pacific coast of North America.

Delphinapterus catodon, (Linné) Gill. White Whale.
Arctic and Subarctic seas.

Monodon monoceros, Linné. Narwhal.
Arctic seas.

Phocæna communis, Lesson. Puffing-Pig. Herring-Hog.
North Atlantic Ocean.

Phocæna lineata, Cope. Striped Porpoise.
Atlantic coast of the United States.

Phocæna vomerina, Gill. California Bay Porpoise.
Pacific coast of the United States.

Family ZIPHIIDÆ. Bottle-nose Whales.

Berardius Bairdii, Stejneger. Baird's Whale.
Bering Island.

Hyperoödon rostratus, (Chemnitz) Wesmael. Bottle-nose Whale.
North Atlantic Ocean.

Ziphius cavirostris, Cuvier.
Temperate and tropical seas.

? Ziphius semijunctus, (Cope).
Atlantic Ocean.

Ziphius Grebnitzkii, Stejneger. Grebnitzky's Bottle-nose Whale.
Bering Island.

Mesoplodon Sowerbiensis, Gervais. Sowerby's Whale.
Temperate North Atlantic.

Family PHYSETERIDÆ. The Sperm Whales.

Physeter macrocephalus, Linné. Sperm Whale.
Temperate and tropical seas.

Kogia breviceps, (De Blainville) Gray. Pygmy Sperm Whale.
Temperate and tropical seas.

Suborder MYSTICETE. Whalebone Whales.

Family BALÆNIDÆ.

Rhachianectes glaucus, Cope. Devil-fish. Gray Whale.
Pacific coast of North America.

Agaphelus gibbosus, Cope. (?) Scragg Whale.
North Atlantic.

Megaptera longimana, (Rud.) Gray. Humpback Whale.
North Atlantic Ocean.

Megaptera bellicosa, Cope. Caribbean Humpback Whale.
Caribbean Sea.

Megaptera versabilis, Cope. Humpback Whale.
North Pacific Ocean.

Physalus antiquorum, (Fischer) Gray. Finback Whale; Razor-back.
North Atlantic Ocean.

Physalus Sibbaldii, Gray.
North Atlantic Ocean.

Balænoptera rostratus, (Müller) Gray. Piked Whale. (? Grampus of New England fishermen.)
North Atlantic Ocean.

Balænoptera Davidsoni, Scammon. Finback Whale.
Northeastern Pacific Ocean.

Sibbaldius laticeps, Gray. Rudolphi's Rorqual.
North Atlantic Ocean.

Sibbaldius tuberosus, Cope.
Mobjack Bay, Virginia.

Sibbaldius veliferus, (Cope). Finback Whale.
Pacific coast of North America.

Sibbaldius tectirostris, Cope.
Coast of Maryland.

Sibbaldius sulfureus, Cope. Sulphur-bottom Whale.
Pacific coast of North America.

Balæna japonica, Gray. Right Whale of North Pacific.
North Pacific Ocean.

Balæna biscayensis, Gray. Black Whale; Right Whale of the North Atlantic.
Temperate North Atlantic.

Balæna mysticetus, Linné. Bowhead Whale.
Arctic Seas.

Order UNGULATA. Ungulates.

Suborder ARTIODACTYLA.

Family DICOTYLIDÆ. The Peccaries.

Dicotyles tajaçu, (Linné) Sclater. Common Peccary.
Arkansas to Patagonia.

Dicotyles labiatus, Cuvier. White-lipped Peccary.
Guatemala to Paraguay.

Family CERVIDÆ. The Deers.

Cariacus macrotis, (Say) Brooke. Mule Deer.
Central North America.

Cariacus columbianus, (Rich.) Gray. Columbia Black-tailed Deer.
Pacific Slope.

Cariacus virginianus, (Boddært) Brooke. Virginia Deer.
Canada to Panama.

Cariacus toltecus, Brooke. Yucatan Deer.
Mexico.

Cariacus rufinus, (Bourcier et Pucheran) Brooke. Black-faced Brocket.
Mexico to Ecuador.

Cervus canadensis, Erxleben. Wapiti; American "Elk".
Virginia, California, and northward.

Alces machlis, (Linné) Gray. Moose. (Elk of Europeans.)
Northern United States and northward.

Rangifer tarandus, (Linné) Gray. Reindeer.
Arctic North America.

Rangifer tarandus grœnlandicus, (Kerr). Barren-ground Caribou.
Arctic America.

Rangifer tarandus caribou, (Kerr). Woodland Caribou.
Northeastern North America.

Family ANTILOCAPRIDÆ. The Prong-horn Antelope.

Antilocapra americana, Ord. Prong-horn Antelope or Cabrit.
Plains west of Missouri from Lower Rio Grande to Saskatchewan.

Family BOVIDÆ. The Cattle.

Bison americanus, (Gmelin) Gray. American Buffalo.
Plains between the Rocky Mountains and Missouri River.

Ovibos moschatus, Blainville. Musk-ox.
Arctic North America.

Ovis montana, Cuvier. Bighorn; Mountain Sheep.
Rocky Mountain regions to Mexico.

Ovis montana Dalli, Nelson. Dall's Mountain Sheep.
Mountains of Alaska and southward into British America.

Mazama montana, (Ord) Gill. Mountain Goat.
Northern Rocky Mountains of the United States and British America.

Suborder PERISSODACTYLA.

Family TAPIRIDÆ. The Tapirs.

Elasmognathus Bairdii, Gill. Baird's Tapir.

Mexico to Panama.

Elasmognathus Dowi, Gill. Dow's Tapir.

Guatemala to Costa Rica.

Order RODENTIA. Rodents.

Suborder SIMPLICIDENTATA.

Family SCIURIDÆ. The Squirrels.

Arctomys pruinosus, Gmelin. Hoary Marmot.

Columbia River northward to Alaska and (?) eastward to Hudson's Bay.

Arctomys monax, (Linné) Schreber. Woodchuck.

Eastern region of the United States and northward.

Arctomys flaviventer, Aud. and Bach. Rocky Mountain Marmot.

Texas, Sonoran region and northward in the Rocky Mountains.

Cynomys columbianus, (Ord) Allen. Western Barking Squirrel: Western "Prairie Dog."

Rocky Mountain region.

Cynomys ludovicianus, (Ord) Baird. Missouri Barking Squirrel; Missouri "Prairie Dog."

Central region from 49° N. Lat. southward into Mexico.

Tamias striatus, (Linné) Baird. Striped Squirrel; Common Chipmunk.

Eastern region of the United States to Canada.

Tamias lateralis, (Say) Allen. Say's Chipmunk.

Central region west of Kansas and Nebraska and northward.

Tamias asiaticus borealis, Allen. Northern Chipmunk.

Northwestern North America southward to United States. Europe. Asia.

Tamias asiaticus Townsendi, (Bachman) Allen. Townsend's Chipmunk.

Northern California to British Columbia.

Tamias asiaticus pallidus, Allen. Pale Chipmunk.

Plains of Upper Missouri and Yellowstone Rivers and Great Basin.

Tamias asiaticus quadivittatus, (Say) Allen. Rocky Mountain Chipmunk.

Central region west of the Rocky Mountains. Southern Californian region and Northern Mexico.

Tamias asiaticus dorsalis, (Baird) Allen. Gila Chipmunk.

New Mexico, Nevada and Arizona.

Tamias Harrisi, (Aud. and Bach.) Allen. Harris' Chipmunk.

Sonoran and Lower Californian regions.

Spermophilus grammurus grammurus, (Say) Allen. Rocky Mountain Lined-tailed Spermophile.

Colorado and Western Texas, southward into Mexico and westward to the Sierra Nevadas.

Spermophilus grammurus Douglassi, (Richardson) Allen. Douglass' Lined-tailed Spermophile. Oregon "Ground Squirrel."

Washington Territory to Northern California.

Spermophilus grammurus Beecheyi, (Richardson) Allen. Californian Lined-tailed Spermophile; Californian "Ground Squirrel."

California and southward into Mexico.

Spermophilus empetra empetra, (Pallas) Allen. Parry's Spermophile.

Northern North America.

Spermophilus empetra erythroglutæus, (Richardson) Allen. Red-throated Spermophile.

Northern North America.

Spermophilus empetra kodiacensis, Allen. Kodiak Spermophile.

Kodiak, Alaska.

Spermophilus Richardsoni Richardsoni, (Sabine) Allen. Richardson's Spermophile.

Northwestern United States northward.

Spermophilus Richardsoni Townsendi, (Bachman) Allen. Townsend's Spermophile.

Northwestern United States.

Spermophilus obsoletus, Kennicott. Kennicott's Spermophile.

Northern Central region.

Spermophilus mollis, Kennicott. Short-tailed Spermophile.

Central region from Rocky Mountains westward.

Spermophilus spilosoma, Bennett. Sonoran Spermophile.

New Mexico and Texas to Mexico.

Spermophilus tereticaudus, Baird. Fort Yuma Spermophile.

Fort Yuma, California.

Spermophilus mexicanus, (Licht.) Wagner. Mexican Spermophile.

Southern Texas into northeastern Mexico.

Spermophilus tridecimlineatus tridecimlineatus, (Mitchill) Allen. Eastern Striped Spermophile.

Central and Eastern regions to Ohio.

Spermophilus tridecimlineatus pallidus, (Mitchill) Allen. Pale Striped Spermophile.

Northeastern portion of the Central region.

Spermophilus Franklini, (Sabine) Lesson. Franklin's Spermophile; Gray-headed Spermophile.

Upper Mississippi Valley; New Jersey (introduced).

Spermophilus annulatus, Aud. and Bach. Annulated-tailed Spermophile.
Western Mexico.

Sciurus hudsonius hudsonius, (Pallas) Allen. Eastern Chickaree. Red Squirrel.
Eastern and Central regions east of the Rocky Mountains, northward to Alaska.

Sciurus hudsonius Fremonti, (Aud. and Bach.) Allen. Fremont's Chickaree.
Central Region, from Rocky Mountains westward and north to southern Wyoming and Idaho.

Sciurus hudsonius Richardsoni, (Bachman) Allen. Richardson's Chickaree.
Western Montana and northern Idaho northward.

Sciurus hudsonius Douglassi, (Gray) Allen. Douglass's Chickaree.
Pacific region from central California northward.

Sciurus carolinensis leucotis, (Gapper) Allen. Northern Gray Squirrel.
Eastern region.

Sciurus carolinensis carolinensis, (Gmelin) Allen. Southern Gray Squirrel.
Austroriparian region, Mexico and southward.

Sciurus carolinensis yucatanensis, Allen. Yucatan Gray Squirrel.
Yucatan.

Sciurus niger cinereus, (Linné) Allen. Northern Fox-Squirrel.
Atlantic coast from southern New England to Georgia.

Sciurus niger niger, (Linné) Allen. Southern Fox-Squirrel.
Maryland to Louisiana.

Sciurus niger ludovicianus, (Custis) Allen. Western Fox-Squirrel.
Basin of the Mississippi and tributaries.

Sciurus fossor, Peale. California Gray Squirrel.
Pacific region, from Oregon southward.

Sciurus Aberti, Woodhouse. Abert's Squirrel.
Colorado and Arizona to northern Mexico.

Sciurus arizonensis, Coues. Arizona Squirrel.
Arizona to Mexico.

Sciurus aureogaster, F. Cuvier. Red-bellied Squirrel.
California to Guatemala.

Sciurus griseoflavus, (Gray) Alston.
Mexico and Guatemala.

Sciurus hypopyrrhus, Wagler. Fire-bellied Squirrel.
Mexico to Panama.

Sciurus Deppei, Peters. Deppe's Squirrel
Mexico, Guatemala and Colombia.

Sciurus æstuans rufo-niger, (Linné) Allen.
Nicaragua to Brazil.

Sciurus chrysurus, Pucheran.

Panama to Colombia.

Sciurus variabilis, Geoffroy. Peruvian Squirrel.

Panama to Bolivia.

Sciuropterus volucella hudsonius, (Gmelin) Allen. Northern Flying-Squirrel.

Northern part of California and Pacific regions to the Rocky Mountains and northward.

Sciuropterus volucella volucella (Pallas), Allen. Southern Flying-Squirrel.

United States except the northwestern portion. Mexico and Guatemala.

Family HAPLODONTIDÆ. The Sewellels.

Haplodon rufus, (Raf.) Coues. Sewellel.

Pacific coast from Northern California northward.

Family CASTORIDÆ. The Beavers.

Castor fiber, Linné. Beaver.

North America generally; Hudson's Bay to Mexico.

Family MURIDÆ. The Mice.

Fiber zibethicus, (Linné) Cuvier. Muskrat.

North America.

Neofiber Alleni, True. Round-tailed Muskrat.

Southern Florida. (Georgiana.)

Cuniculus torquatus, (Pallas) Coues. White Lemming.

Arctic America, Greenland, and corresponding latitudes of the old World.

Myodes obensis, Brants. Lemming.

Northwestern North America. Asia.

Synaptomys Cooperi, Baird. Cooper's Mouse.

Indiana, Illinois, Kansas, Minnesota, Oregon, and Alaska.

Evotomys rutilus, (Pallas) Coues. Red-backed Mouse.

Circumpolar regions.

Evotomys rutilus Gapperi, (Vigors) Coues. Gapper's Mouse.

Northern frontier of United States from ocean to ocean. Nova Scotia, south to Massachusetts.

Arvicola pinetorum, (Le Conte) Baird. Pine Mouse.

United States east of the Mississippi from Massachusetts southward. Kansas, Oregon, and Mexico.

Arvicola quasiater, Coues.

Mexico.

Arvicola austerus, Le C. Prairie Meadow Mouse.

Western States and adjoining Territories. Louisiana.

Arvicola austerus curtatus, Cope. Western Prairie Mouse.

United States west of the Mississippi.

Arvicola oregonus, Bachman. Oregon Meadow Mouse.

Pacific coast.

Arvicola riparius borealis, (Rich.) Coues. Little Northern Meadow Mouse.

British America.

Arvicola riparius riparius, (Ord). Common American Meadow Mouse.

All North America.

Arvicola xanthognathus, Leach. Chestnut-cheeked Meadow Mouse.

North America north of the United States.

Arvicola Townsendi, Bachman. Townsend's Meadow Mouse.

Oregon and Washington Territory.

Arvicola mexicanus, De Saussure.

Mexico.

Hesperomys palustris, (Harlan) Baird. Rice-field Mouse.

South Atlantic and Gulf States; Kansas. Mexico and Guatemala. West Indies.

Hesperomys Couesi, Alston.

Mexico and Guatemala.

Hesperomys leucogaster, (Max. zu Wied). Missouri Mole-Mouse.

Region of the Upper Missouri. Red river of the North.

Hesperomys torridus, Coues. Arizona Mole Mouse.

Arizona.

Hesperomys leucopus leucopus, (Le Conte) Coues. White-footed Mouse.

United States generally.

Hesperomys leucopus gossypinus, (Le Conte) Coues.

South Atlantic States; Kansas.

Hesperomys leucopus sonoriensis, (Le Conte) Coues.

Western central North America from Alaska to Mexico.

Hesperomys leucopus eremicus, (Baird) Coues. Desert Mouse.

Valley of the Gila and Colorado Rivers.

Hesperomys michiganensis, (A. & B.) Wagner. Michigan Mouse.

Upper Mississippi Valley.

Hesperomys californicus, (Gambel) Baird. Parasitic Mouse.

Southern California and Mexico.

Hesperomys aztecus, De Saussure. Aztec Mouse.

California to Mexico.

Hesperomys mexicanus, De Saussure.

Mexico.

Hesperomys aureolus, (Aud. and Bach.) Wagner. Red Mouse; Golden Mouse.

Central and Southern States to Mexico.

Hesperomys melanophrys, Coues. Black-eyed Mouse.

Southern Mexico.

Hesperomys teguina, Alston.

Guatemala.

Hesperomys nudicaudus, Peters.

Guatemala.

Hesperomys panamensis, Gray.

Panama and Colombia.

Hesperomys Sumichrasti, De Saussure.

Mexico and Guatemala.

Hesperomys pilorides, (Desmarest).

Antilles.

Ochetodon humilis, (Bach.) Coues. Little Harvest Mouse.

Mississippi Valley and Gulf States to Mexico.

Ochetodon longicauda, (Baird) Coues.

California? Guatemala.

Ochetodon mexicanus, (De S.) Coues.

Louisiana to Mexico and Guatemala.

? Ochetodon montanus, Baird. (Doubtful species.)

Rocky Mountains, lat. 39°.

Sigmodon hispidus, Say and Ord. Cotton Rat.

Southern United States to Panama.

Neotoma cinerea, (Ord) Baird. Bushy-tailed Wood Rat.

Western and Northwestern North America; eastward to Hudson's Bay, Nebraska, and Colorado; southward to New Mexico and California.

Neotoma floridana, (Ord) Coues. Wood Rat.

Southern United States and Northern Mexico. Rarely northward to Massachusetts and the Northern Missouri.

Neotoma fuscipes, Cooper. Dusky-footed Wood Rat.

California and Northern Mexico.

Neotoma ferruginea, Tomes.

Mexico and Guatemala.

Family GEOMYIDÆ. The Gophers.

Thomomys clusius, Coues. Rocky Mountain Pocket-Gopher.

Rocky Mountains.

Thomomys talpoides talpoides, (Richardson) Coues. Northern Pocket-Gopher.

Central region and northward.

Thomomys talpoides bulbivorus, (Richardson) Coues. Pacific Pocket-Gopher.
Pacific region.

Thomomys talpoides umbrinus, (Richardson) Coues. Southern Pocket-Gopher.
Lower Californian and Sonoran regions. Southern Central region. Texan district.

Geomys tuza, (Ord) Coues. Salamander. Florida Pocket-Gopher.
Georgia, Florida and Alabama.

Geomys bursarius, (Shaw) Richardson. Common Pocket-Gopher.
Eastern Mississippi Valley and northward.

Geomys castanops, (Baird) Le Conte. Pecos. Chestnut Pocket-Gopher.
Texas and New Mexico.

Geomys mexicanus, (Licht.) Baird. Tucan. Mexican Pocket-Gopher.
Mexico.

Geomys hispidus, Le Conte. Quackil. Central American Pocket-Gopher.
Mexico and Central America.

Family SACCOMYIDÆ. The Pouched Rats.

Perognathus monticola, Baird. Mountain Pocket Mouse.
Utah to Northern California.

Perognathus penicilliatus, Woodhouse. Tuft-tailed Pocket Mouse.
Basin of the Colorado River.

Perognathus fasciatus, Max. zu Wied.
United States, between the Mississippi River and Rocky Mountains. Northern Mexico.

Perognathus hispidus, Baird. Hispid Pocket Mouse.
Tamaulipas, Mexico.

Cricetodipus parvus, Baird. Least Pocket Mouse.
United States, west of the Rocky Mountains.

Cricetodipus flavus, Baird. Yellow Pocket Mouse.
Rocky Mountain Region southward into Mexico.

Dipodomys Phillipsi Ordii, (Woodhouse) Coues. Ord's Pocket Rat. "Kangaroo Rat."
Rocky Mountain Region.

Dipodomys Phillipsi Phillipsi, (Gray.) Phillips' Pocket Rat. "Kangaroo Rat."
Washington Territory to Mexico.

Heteromys anomalus, (Thompson).
Antilles and Trinidad.

Heteromys longicaudatus, Gray.
Mexico to Venezuela.

Heteromys Desmarestianus, Gray.
Guatemala.

Family ZAPODIDÆ. The Jumping-Mice.

Zapus hudsonius, Coues.
North America generally.

Family OCTODONTIDÆ.

Capromys brachyurus.
Jamaica.

Capromys prehensilis, Poeppig.
Cuba.

Capromys melanurus, Poey.
Cuba.

Capromys pilorides, Say.
Cuba.

Plagiodontia ædium, F. Cuvier.
Hayti and Jamaica.

Family HYSTRICIDÆ. The Porcupines.

Erethrizon dorsatus dorsatus, (Linné) Allen. Canada Porcupine.
New England and Ohio northwestward.

Erethrizon dorsatus epixanthus, (Brandt) Allen. Western Porcupine.
Central Californian and Sonoran Regions, northward into Alaska, southward into Mexico.

Synetheres mexicanus, (Kerr) Alston.
Mexico to Costa Rica.

Family CAVIIDÆ. Cavies.

Dasyprocta mexicana, De Saussure.
Mexico.

Dasyprocta cristata, (Geoffroy) Desmarest.
West Indies.

Dasyprocta punctata, Gray.
Mexico to Costa Rica.

Dasyprocta isthmica, Alston.
Costa Rica and Panama.

Cœlogenys paca, (Linné) Tomes.
Mexico to Paraguay.

Suborder DUPLICIDENTATA.

Family LAGOMYIDÆ. The Pikas.

Lagomys princeps, Richardson. North American Pika.
Central and Californian Regions from the Rocky Mountains westward, in the highest regions.

Family LEPORIDÆ. The Hares.

Lepus timidus, Linné. Polar Hare.

Europe, North America, from Labrador northwestward to the Arctic coast.

Lepus americanus americanus, (Erxleben) Allen. Northern Varying Hare.

New England and Middle States northward.

Lepus americanus virginianus, (Harlan) Allen. Southern Varying Hare.

? Pennsylvania northward.

Lepus americanus Bairdii, (Hayden) Allen. Rocky Mountains Varying Hare.

Summits of the Rocky Mountains.

Lepus americanus Washingtoni, (Baird) Allen. Western Varying Hare.

? Northwestern North America.

Lepus sylvaticus sylvaticus, (Bachman) Allen. Wood Hare; "Gray Rabbit;" "Wood Rabbit."

United States generally. Mexico.

Lepus sylvaticus Audubonii, (Baird) Allen. Audubon's Hare.

California.

Lepus sylvaticus arizonæ, Allen. Desert Hare.

Southern Arizona. Kernville, Cal.

Lepus sylvaticus Nuttalli, (Bachman) Allen. Sage Hare.

Central and Sonoran Regions. Mexico.

Lepus campestris, Bachman. Prairie Hare.

Northwestern United States from Kansas westward to Northern California, northward to British Columbia.

Lepus Trowbridgei, Baird. Trowbridge's Hare.

Pacific and Lower Californian Regions south of Oregon.

Lepus californicus, Gray. Californian Hare.

California to Cape Saint Lucas.

Lepus aquaticus, Bachman. Water Hare.

Austroriparian Region from Alabama southwestward into Mexico.

Lepus palustris, Bachman. Marsh Hare.

Austroriparian Region to Guatemala.

Lepus callotis texianus, (Waterhouse) Allen. Northern Jackass Hare.

Central and Sonoran Regions, south of Oregon. Texan District. Mexico.

Lepus callotis callotis, (Wagler) Allen. Mexican Hare; Southern Jackass Hare.

Southern boundary of the United States southward.

Lepus Graysoni, Allen. Grayson's Hare.

Mexico and Costa Rica.

Lepus brasiliensis Gabbi, Allen Central American Hare.
Costa Rica to Colombia.

Lepus brasiliensis brasiliensis, (Linné) Allen. Brazilian Hare. Tapeti.
Central America southward.

Order CHIROPTERA. Bats.

Suborder MICROCHIROPTERA. The Typical Bats.

Family VESPERTILIONIDÆ. The True Bats.

Anthrozous pallidus, (Le Conte) H. Allen. Pale Bat.
United States west of the Rocky Mountains; Oregon to Mexico.

Vesperugo serotinus, (Schreber) Dobson. Serotine Bat.
All zoographical regions except Australia. In America, from Winnipeg to West Indies.

Vesperugo propinquus, Peters.
Guatemala and Honduras.

Vesperugo albigularis, Peters.
Mexico.

Vesperugo georgianus, (F. Cuv.) Dobson. Georgian Bat.
United States.

Vesperugo noctivagans, (Le Conte) Dobson.
United States from Atlantic Ocean to Rocky Mountains

Vesperugo parvulus, (H. Allen) Dobson.
Mexico to Costa Rica.

Vesperugo hesperus, (H. Allen) Dobson.
California.

Nycticejus crepuscularis, Le Conte.
United States from the Great Lakes southward to Mexico.

Atalapha noveboracensis, (Erxleben) Peters. Red Bat.
Canada to Chili.

Atalapha cinerea, (Beauvois) Peters. Hoary Bat.
Nova Scotia to Chili.

Atalapha intermedia, (Allen) Peters.
Texas and Mexico.

Vespertilio nitidus, H. Allen. Californian Bat.
United States west of the Rocky Mountains. California, Texas and Mexico.

Vespertilio nigricans, Max. zu Wied.
Mexico to South Brazil.

Vespertilio evotis, H. Allen.
Pacific coast west of the Rocky Mountains.

Vespertilio subulatus, Say. Little Brown Bat.
North America east of the Rocky Mountains; Mexico.

Vespertilio Carolii, Temminck.
North America.

Vespertilio albescens, Geoffroy.
Mexico and Brazil.

Vespertilio lucifugus, Le Conte. Blunt-nosed Bat.
Hudson Bay to Brazil.

Natalus stramineus, Gray.
Mexico to Brazil.

Natalus lepidus, (Gervais) Dobson.
Cuba.

Family EMBALLONURIDÆ.

Rhynchonycteris naso, (Max. zu Wied) Peters.
Guatemala to Brazil.

Saccopteryx bilineata, (Temminck) Peters.
Guatemala to Brazil.

Saccopteryx canina, (Max. zu Wied) Dobson.
Guatemala to Brazil.

Saccopteryx plicata, (Peters) Dobson.
Mexico and Costa Rica.

Diclidurus albus, Max. zu Wied.
Guatemala to Brazil.

Noctilio leporinus mastivus, (Dahl) Dobson.
Amtillean and Brazilian subregions.

Molossus rufus, Geoffroy. Red Mastiff Bat.
Mexico to Brazil.

Molossus nasutus, Spix.
Guatemala and Brazil.

Molossus abrasus, (Temminck) Peters.
Guatemala and Brazil.

Nyctinomus macrotis, Gray.
Cuba, Brazil, Paraguay.

Nyctinomus gracilis, (Wagner) Peters.
Guatemala, Panama, and Brazil.

Nyctinomus brasiliensis, Is. Geoffroy.
Kansas and California to Chili.

Family PHYLLOSTOMIDÆ. The Leaf-nosed Bats.

Chilonycteris Macleayi, Gray.
Cuba, Jamaica, Hayti.

Chilonycteris personata, Wagner.
Guatemala, Venezuela, Brazil.

Chilonycteris Parnelli, (Gray) Peters.
Cuba; Jamaica.

Chilonycteris rubiginosa, Wagner.
Mexico to Brazil.

Chilonycteris Davyi, (Gray) Dobson.
Mexico to Brazil.

Mormops megalophylla, Peters.
Mexico to Venezuela.

Mormops Blainvillei, Leach.
Cuba; Jamaica.

Lonchorhina aurita, Tomes.
Trinidad; West Indies.

Macrotus Waterhousei, Gray. Waterhouse's Bat.
California, Mexico and the West Indies.

Macrotus Bocourtianus, Dobson. Bocourt's Bat.
Guatemala.

Vampyrus spectrum, (Linné) Peters.
Guatemala to Brazil.

Vampyrus auritus, Peters.
Mexico and Brazil.

Schizostoma hirsutus, Peters.
Locality unknown.

Schizostoma megalotis, (Gray) Peters.
Mexico to Brazil.

Schizostoma Behnii, Peters.
Cuyaba; Cosnipata.

Trachyops cirrhosus, (Spix) Peters.
Mexico to Brazil. Bermuda.

Phyllostoma hastatum, (Pallas) E. Geoffroy.
Panama to Brazil.

Mimon Bennettii, Gray.
Mexico; South America.

Carollia brevicauda, (Max. zu Wied) Peters.
Mexico to Brazil.

Glossophaga soricina, (Pallas) Peters.
Central and South America as far as Chili.

Phyllonycteris Poeyi, Gundlach et Peters.
Cuba.

Phyllonycteris Sezekorni, Gundlach et Peters.
Cuba and Jamaica.

Monophyllus Redmani, Leach.
Cuba and Jamaica.

Ischnoglossa nivalis, De Saussure.
Mexico and Guatemala.

Glossonycteris lasiopyga, Peters.
Mexico to Brazil.

Chœronycteris mexicana, Tschudi.
Mexico and Guatemala.

Chœronycteris minor, Peters.
Guatemala to Brazil.

Artibeus perspicillatus, (Linné) Gray.
Mexico to Brazil.

Artibeus cinereus, (Gervais) Dobson.
Mexico to Brazil.

Vampyrops lineatus, (E. Geoffroy) Peters.
Mexico to Paraguay.

Vampyrops vittatus, (Peters) Dobson.
Costa Rica and Venezuela.

Stenoderma achradophilum, (Gosse) Dobson.
Cuba, Jamaica.

Stenoderma falcatum, (Gray) Dobson.
Cuba.

Chiroderma Salvini, Dobson.
Costa Rica and Colombia.

Pygoderma bilabiatum, (Wagner) Dobson.
Mexico and Brazil.

Sturnira lilium, (E. Geoffroy) Dobson.
Mexico to Chili.

Brachyphyllum cavernarum, Gray.
West Indies.

Centurio senex, Gray.
Mexico.

Centurio McMurtrii, H. Allen.
Mexico and Guatemala.

Desmodus rufus, Max. zu Wied.
Mexico to Chili.

Diphylla ecaudata, Spix.
Guatemala, Ecuador and Brazil.

Order INSECTIVORA. Insectivores.

Suborder INSECTIVORA-VERA. Typical Insectivores.

Family SORICIDÆ. The Shrews.

Neosorex navigator, Cooper. Water Shrew.
Washington Territory.

Neosorex palustris, (Rich.) Coues.

Sorex Trowbridgei, Baird. Trowbridge's Shrew.
Washington Territory.

Sorex parvus, Say.

Sorex Forsteri, Richardson. Forster's Shrew.
Hudson's Bay. New York. Pennsylvania.

Sorex platyrhinus, Wagner. Eared Shrew.
Vermont, Massachusetts, and Ohio.

Sorex Cooperi, Bachman. Cooper's Shrew.
Labrador to Nebraska.

Sorex Hoyi, Baird. Hoy's Shrew.
Racine, Wisconsin.

Sorex Crawfordi, Baird. Crawford's Shrew.

Sorex pacificus, Baird.
Oregon.

Sorex sphagnicola, Coues.
Hudson's Bay Territory.

Sorex veræ-pacis, Alston.
Guatemala.

Atophyrax Bendirei, Merriam. Bendire's Shrew.
Oregon.

Blarina brevicauda, (Say) Baird. Short-tailed Shrew.
Illinois to Nebraska.

Blarina cinerea, (Bachman) Baird.
Pennsylvania to Florida.

Blarina mexicana, Coues.
Mexico.

Family TALPIDÆ. The Moles.

Scalops aquaticus aquaticus, (Linné) Coues. Common Mole
Eastern United States.

Scalops aquaticus argentatus, (Aud. & Bach.) Coues. Silvery Mole.
Prairies west of the Alleghanies.

Scapanus Breweri, (Bachman) Pomel. Hairy-tailed Mole.
Eastern United States.

Scapanus Townsendii, (Bachman) Pomel. Oregon Mole.

Pacific Slope.

Condylura cristata, (Linné) Illiger. Star-nosed Mole.

Northern cismontane States.

Neürotrichus Gibbsii, (Baird) Günther.

Cascade Mountains. Washington Territory.

Family SOLENODONTIDÆ. The Solenodonts.

Solenodon cubanus, Peters.

Cuba.

Solenodon paradoxus, Brandt.

Hayti.

Order CARNIVORA. Flesh Eaters.

Suborder PINNIPEDIA. The Sea-Lions and Seals.

Family OTARIIDÆ. The Eared Seals.

Zalophus californianus, (Lesson) Allen. Californian Sea-lion.

Coast of California.

Eumetopias Stelleri, (Lesson) Peters. Steller's Sea-lion.

North Pacific from Bering Straits to California.

Callorhinus ursinus, (Linné) Gray. Northern Fur Seal. Sea Bear.

Shores of the North Pacific.

Family PHOCIDÆ. The Seals.

Phoca vitulina, Linné. Harbor Seal.

North Atlantic from New Jersey to the Arctic regions; European coast; North Pacific from Southern California to Arctic regions.

Phoca grœnlandica, Fabricius. Harp Seal.

North Atlantic from Newfoundland to Arctic Seas; North Pacific.

Phoca fœtida, Fabricius. Ringed Seal.

North Atlantic, North Pacific, and Arctic Seas.

Phoca fasciata, Zimmerman. Ribbon Seal.

North Pacific.

Erignathus barbatus, (Fabr.) Gill. Bearded Seal.

North Atlantic, North Pacific, and Arctic Seas.

Halichœrus grypus, (Fabr.) Nilsson. Gray Seal.

North Atlantic from Newfoundland and Western Islands northward.

Monachus tropicalis, Gray. West Indian Seal.

West Indies; Florida (?); Mexico (?).

Cystophora cristata, (Erxleben) Nilsson. Hooded Seal.
North Atlantic and Arctic Seas.

Macrorhinus angustirostris, Gill. Californian Sea-elephant.
Coast of Southern California and Western Mexico.

Family ODOBÆNIDÆ. The Walruses.

Odobænus rosmarus, (Malmgren). Atlantic Walrus.
Labrador to the Arctic Circle; Arctic Europe and Asia.

Odobænus obesus, (Ill.) Allen. Pacific Walrus.
Bering Straits.

Suborder FISSIPEDIA. The Terrestrial Carnivores.

Family URSIDÆ. The Bears.

Ursus americanus, Pallas. Black Bear.
North America from Mexico to Alaska.

Ursus horribilis, Ord. Grizzly Bear.
Western North America from Mexico to Alaska.

Ursus Richardsoni, Audubon & Bachman. Barren-Ground Bear.
Barren grounds of northwestern North America.

Thalassarctos maritimus, (Linné) Gray. White or Polar Bear.
Northern America, Europe, and Asia.

Family PROCYONIDÆ. The Raccoons.

Cercoleptes caudivolvulus, (Pallas) Tomes.
Mexico to Peru.

Nasua narica, (Linné) Allen.
Texas to Panama.

Procyon lotor, (Linné) Storr. Raccoon.
United States and Central America.

Procyon cancrivorus, (Cuvier) Sclater. Crab-eating Raccoon.
Panama to Guiana.

Bassaris astuta, Lichtenstein. Common Cacomistle.
Oregon; Ohio to Mexico.

Bassaris Sumichrasti, De Saussure. Southern Cacomistle.
Mexico to Costa Rica.

Bassaricyon Gabbi, Allen.
Costa Rica.

Family MUSTELIDÆ. The Weasels.

Enhydris lutris, (Linné) De Kay. Sea Otter.
North Pacific Ocean south to Lower California.

Lutra canadensis, (Turton) F. Cuv. North American Otter.
North America generally.

Lutra felina, Molina. Chinchimen.
California to Chili; (?) Alaska.

Lutra brasiliensis, F. Cuvier. South American Otter.
Central and South America.

Mephitis mephitica, (Shaw) Baird. Common Skunk.
Hudson's Bay to Guatemala.

Mephitis putorius, (Linné) Coues. Little Striped Skunk.
Carolinas northwestward to British Columbia, southwestward to Guatemala.

Mephitis macrurus, Licht. Long-tailed Mexican Skunk.
Mexico.

Mephitis chilensis, F. Cuvier. Chilian Skunk.
Costa Rica and southward through South America.

Conepatus mapurito, (Gmelin) Coues. White-backed Skunk.
Southwestern border of the United States southward to Costa Rica.

Taxidea americana americana, (Boddaert). American Badger.
Hudson's Bay to Mexico.

Taxidea americana Berlandieri, (Baird) Gray. Mexican Badger.
Southwestern border of the United States southward.

Gulo luscus, (Linné) Sabine. Wolverine.
Northern half of the United States to the Arctic Ocean.

Galictis barbara, (Linné) Franklin. Tayra.
Mexico to La Plata.

Putorius vison, (Schreber) Gapper. American Mink.
All North America.

Putorius nigripes, A. & B. American or Black-footed Ferret.
Central region east of the Rocky Mountains.

Putorius vulgaris, Linné. Least Weasel.
Northern United States northward; Europe; Asia.

Putorius erminea, (Linné) Griffith. Ermine; Stoat.
United States, except the Austroriparian and Sonoran regions, northward to the Arctic coast.

Putorius longicauda, (Bp.) Rich. Long-tailed Weasel.
Central and Sonoran regions northward.

Putorius brasiliensis frenatus, (Stewart) Coues. Bridled Weasel.

Californian and Sonoran regions and Southern Texas southward to Guatemala.

Putorius brasiliensis æquatorialis. (Stewart) Coues. Æquatorial Weasel.

Guatemala to Ecuador.

Mustela Pennanti, Erxleben. Pekan; Pennant's Marten.

Eastern and central and Pacific regions northward to the Arctic Circle.

Mustela americana, Turton. American Sable or Marten.

New England eastward to the Pacific coast, northward to the Arctic coast.

Family CANIDÆ. The Dogs.

Urocyon virginianus virginianus, (Schreber). Gray Fox.

United States southward to Costa Rica.

Urocyon virginianus littoralis, (Baird) Gill. Coast Gray Fox.

Coast of California.

Vulpes velox, (Say) Aud. & Bach. Kit Fox or Swift Fox.

United States west of the Mississippi.

Vulpes macrurus, Baird. Prairie Fox.

Rocky Mountain region of the United States.

Vulpes fulvus fulvus, (Desmarest). Red Fox.

Arctic America to Northern United States.

Vulpes fulvus argentatus. (Shaw) Aud. & Bach. Silver Fox; Black Fox.

Arctic America to Northern United States.

Vulpes fulvus decussatus, (Desm.). Cross Fox.

Arctic America to Northern United States.

Vulpes lagopus, (Linné) Gray. Arctic Fox.

Arctic regions of the globe south to 50° N.

Canis lupus griseo-albus, (Linné) Sabine. Gray Wolf.

North America.

Canis latrans, Say. Coyote.

Saskatchewan to Costa Rica.

Family FELIDÆ. The Cats.

Felis concolor, Linné. Puma or Cougar.

America generally.

Felis pardalis, Linné. Ocelot or Tiger Cat.

Arkansas to Patagonia.

Felis onça, Linné. Jaguar.

Louisiana to Patagonia.

Felis yaguarundi, Desmarest. Yaguarundi Cat.
Texas to Paraguay.

Felis eyra, Desmarest. Eyra Cat.
Texas to Paraguay.

Felis tigrina, Erxleben. Margay Cat.
Mexico to Paraguay.

Lynx borealis canadensis, (Gray) Mivart. Canada Lynx.
Northern North America.

Lynx maculatus, (Vigors & Horsfield). Spotted Lynx.
Texas, California and Northern Mexico.

Lynx rufus, (Güldenstadt) Rafinesque. Red Lynx.
Southern United States and Mexico.

Order PRIMATES. The Primates.

Suborder ANTHROPOIDEA. Monkeys and Man.

Family HAPALIDÆ. The Marmosets.

Midas Geoffroyi, (Pucheran) Sclater. Geoffroy's Marmoset.
Panama and Colombia.

Family CEBIDÆ. The New-World Monkeys.

Chrysothrix Œrstedi, Reinhardt. Red-backed Teetee: Squirrel Monkey.
Costa Rica and Panama.

Nyctipithecus rufipes, Sclater. Red-footed Douroucouli, or Owl Monkey.
Nicaragua.

Nyctipithecus vociferans, Spix. Douroucouli, or Owl Monkey.
Costa Rica to Peru.

Cebus hypoleucas, (Humboldt) Sclater. White-throated Capuchin.
Nicaragua to Colombia.

Ateles vellerosus, Gray. Mexican Spider-Monkey.
Mexico, Guatemala and Honduras.

Ateles Geoffroyi, Kuhl. Geoffroy's Spider-Monkey.
Nicaragua to Colombia.

Ateles ater, F. Cuvier. Black-faced Spider-Monkey.
Panama to Peru.

Ateles rufiventris, Sclater. Red-bellied Spider-Monkey.
Panama and Colombia.

Mycetes villosus, Gray. Villous Howler.
Guatemala and Honduras.

Mycetes palliatus, Gray. Mantled Howler.
Nicarua southward to Panama.

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 30.

A LIST OF BIRDS THE EGGS OF WHICH ARE WANTED TO COMPLETE THE SERIES IN THE NATIONAL MUSEUM, WITH INSTRUCTIONS FOR COLLECTING EGGS.

By Captain CHARLES E. BENDIRE, U. S. A.,
Honorary Curator, section of Oölogy, U. S. National Museum.

Species marked with a * are, with few exceptions, entirely wanting in the collection, or only represented by a few foreign, and for the greater part very poorly prepared, specimens. All of these species are especially desired.

Species marked with a † are represented in the collection in most instances by poor specimens, or else by but a small number of good ones, and others are much needed.

Species marked with a § are represented by a fair series of specimens, but further additions will be acceptable.

It is very desirable that eggs should be well prepared, kept in sets, and that complete data, that is, date and locality of collecting, situation of nest, and anything else of interest, be furnished with each set. The nests of all the rarer species will also be very acceptable.

Eggs should be blown through a single small hole neatly drilled on one side, and care be taken to remove the entire contents. A simple blow-pipe and a few different sized drills are all that is required. Many collectors use very fine glass points attached to a rubber bulb. Others use an instrument manufactured by E. W. Ellsworth, East Windsor Hill, Conn., which is about the best implement known to me for the purpose.

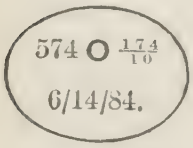
To blow an egg.—Drill a small hole on the side and in the center of the egg, insert the tip of the blow-pipe for a very short distance, and remove the contents as far as this can readily be done. Small portions of the albumen and yolk of the egg will usually remain in the shell, and this is best removed by forcing water into the egg with a small syringe, holding the point of the latter over the hole and an inch from it. This will always allow a part of the water to enter. When about half full, shake the egg, holding it between the fingers, and then blow out the

contents. If the water does not come out perfectly clear, repeat the process until it does. Eggs that have been thoroughly cleaned will retain their original color much better, and insects or mice are not apt to trouble them. After the egg has been cleaned it should be put away, hole downward, and allowed to drain. The best material to place an egg on to absorb whatever moisture may remain in it after cleaning is corn meal. Particles of this substance that may remain sticking about the hole of the eggs are easily removed by a slight touch of the fingers.

To pack eggs.—Many rare specimens are lost by improper packing. Egg-shells, even after having been blown, should (during transit, at least) never touch each other. Each egg should be wrapped separately in cotton, and they should not be packed too close. In sending eggs through the mail they should be packed in stout wooden boxes, the box being first lined with cotton all around and the eggs placed in afterwards, rather loosely, each egg wrapped in cotton by itself. Tin boxes are not as good as wooden ones. Cigar boxes answer well, provided they are partitioned off through the middle to prevent the lid being crushed in on top of the eggs, which often happens where this precaution is not taken.

Marking eggs.—Eggs should be marked with a soft pencil in preference to anything else, as these marks can always be washed off clean, when it is desirable to do so, which cannot be done when certain inks are used. A good way is to place the catalogue number of the eggs on one side of the hole and the set number, and number of the eggs contained in the set, on opposite sides. The date of collecting can, if desired, be placed below, and it is well to mark this on at least one egg of each set.

For instance, I desire to mark a set of ten eggs of the Sora Rail (*Porzana carolina*), taken June 14, 1884. The marks would be thus, Catalogue No. 574, Smithsonian Check-list of 1881:



Set mark of collector.
No. of eggs in set.
Date.

Eggs look much better when they are clean; and soiled ones, when first taken, can easily be cleaned with a little soap and water at the time of blowing them, while it is often impossible to remove stains on the shell, if they have been allowed to remain any length of time.

CHS. E. BENDIRE.

The numbers are those of the "Nomenclature of North American Birds," published as Bulletin 21. of the U. S. National Museum.

§1	§4*a*	†[6]	†9	13	§15	†17	†[21]
§2	†5	7	§10	§13*a*	†15*a*	*18	22
§3	†5*a*	7*a*	11	†14	†16	†19	§23
4	†5*b*	*8	12	†14*a*	*16*a*	*[20]	24

†25 | §67 | *116*a* | †164 | *205 | §241 | 289 | †336
†26 | †67*a* | †117 | †164*a* | §206 | 242 | †290 | †337
§27 | †68 | †118 | *165 | §207 | §242*a* | †290*a* | §338
†28 | §[69] | §119 | *166 | 207*a* | †243 | *290*b* | †339
*29 | §[70] | †120 | *[167] | †208 | §244 | †290*c* | §340
†30 | †71 | †121 | *168 | †209 | 245 | †291 | †341
*31 | †[72] | §122 | †168*a* | 210 | §246 | †292 | *342
*32 | †73 | 123 | †169 | 211 | *247 | §293 | †343
*33 | †74 | 123*a* | 170 | 211*a* | §248 | *294 | *344
*33*a* | *74*a* | §124 | *170*a* | †212 | 249 | *295 | *345
*[34] | §75 | †125 | *171 | §213 | †250 | †296 | *346
†35 | *76 | §125*a* | †172 | 214 | §251 | †297 | †347
†36 | †77 | *126 | *172*a* | *215 | *252 | *297*a* | *348
†37 | *78 | *127 | *173 | *216 | *253 | *297*b* | *349
†38 | †79 | §128 | †174 | §217 | §254 | *298 | *350
*39 | *80 | †129 | *175 | §218 | *255 | *[299] | §351
†40 | †81 | *130 | *175*a* | †219 | †256 | †300 | †352
†41 | *82 | *131 | *176 | †220 | §257 | †300*a* | †353
*41*a* | †83 | *132 | *177 | †221 | 258 | †300*b* | †354
§41*b* | †84 | *133 | *178 | †222 | §258*a* | §301 | †355
§42 | †85 | *134 | †178*a* | †223 | †259 | *[302] | †356
*43 | §86 | §135 | *179 | §224 | 260 | †303 | 357
†[44] | §86*a* | *136 | *179*a* | †225 | 261 | 304 | §357*a*
*45 | *87 | †137 | *180 | †225*a* | 261*a* | *305 | †357*b*
†46 | §88 | *138 | §181 | †226 | *262 | 306 | †358
†46*a* | *89 | †139 | †182 | *226*a* | 263 | †307 | †359
§47 | *89*a* | §139*a* | *182*a* | †227 | 263*a* | *308 | §360
*48 | †90 | †140 | *182*b* | †228 | 264 | *309 | *360*a*
*49 | *91 | †141 | †183 | §229 | *265 | *310 | *360*b*
§50 | *92 | §141*a* | *184 | †230 | *266 | *311 | §361
§51 | 93 | §141*b* | †185 | *230*a* | *267 | §312 | §361*a*
†51*a* | *94 | †142 | 186 | 231 | †268 | §313 | †362
§52 | †95 | §143 | 187 | 231*a* | §169 | †314 | †363
†53 | †96 | *144 | †188 | †231*b* | 270 | 315 | *363*a*
§54 | †97 | †145 | †189 | †231*c* | §271 | †316 | †364
†55 | *98 | †146 | †190 | †231*d* | 272 | §317 | *365
*55*a* | §99 | *147 | †191 | *231*e* | †273 | †318 | †366
§56 | †100 | †148 | *192 | †232 | 274 | *319 | †367
§57 | §101 | §149 | †193 | §233 | §275 | §320 | †368
§58 | †102 | 149*a* | §193*a* | §234 | *276 | §321 | *368*a*
†58*a* | †103 | *149*b* | †193*b* | §235 | §277 | †322 | †369
*59 | *103*a* | †150 | †194 | §235*a* | *278 | §323 | †369*a*
§59*a* | *104 | §151 | *195 | †235*b* | †278*a* | §324 | †369*b*
§60 | *105 | §152 | *196 | §235*c* | 278*b* | 325 | †370
*60*a* | *106 | *152*a* | 197 | §236 | [279] | §325*a* | †371
†60*b* | †107 | 153 | 197*a* | 237 | §280 | §326 | †372
†61 | *108 | 154 | §198 | †237*a* | †281 | *327 | †373
§61*a* | †109 | §155 | †198*a* | §238 | 282 | 328 | †374
†61*b* | *110 | †156 | †199 | §238*a* | *282*a* | *329 | §375
*62 | †111 | 157 | *200 | §238*b* | †282*b* | *329*a* | §376
63 | *112 | †158 | †201 | *238*c* | †283 | †330 | †377
63*a* | †113 | *159 | *201*a* | *238*d* | †284 | *331 | *377*a*
*64 | *113*a* | *160 | †202 | §239 | †285 | *332 | 378
†65 | †114 | †161 | *203 | §240 | §286 | *333 | *378*a*
†65*a* | §115 | †162 | 204 | †240*a* | †287 | *334 | 378*b*
*66 | §116 | *163 | 204*a* | §240*b* | *288 | †335 | ‡379

*380	420	†469	*[514]	564	†612	§662	*714
*381	*420*a*	†470	515	†565	†613	†663	*715
382	*421	§470*a*	*515*a*	†566	†614	†664	*716
†383	*[422]	†471	516	§567	§615	[665]	*717
*384	†423	§471*a*	§517	*568	†616	†666	*[718]
§385	*424	†471*b*	†518	§569	†617	§666*a*	*[719]
†386	§425	†472	[519]	§570	†618	*667	*720
§387	†426	†472*a*	§520	§571	†619	§668	†721
†388	†427	§473	†520*a*	*571*a*	†620	†669	*722
*389	†428	†473*a*	§521	572	†621	§670	†723
†390	†429	†473*b*	§522	[573]	*622	[671]	*724
*391	430	474	†523	574	623	†672	*725
†392	431	475	[524]	†575	*624	§673	†726
*393	§432	†476	§525	†576	†625	†674	*727
§394	†433	477	[526]	*576*a*	§626	†675	*728
§395	†433*a*	†477*a*	§526*a*	[577]	§627	*676	†729
§396	†434	§478	†527	†578	*627*a*	†677	†730
§397	[435]	§478*a*	†527*a*	579	§628	*678	†731
*397*a*	†436	§479	†528	580	§629	†679	§732
†398	*436*a*	480	*529	†581	†630	†680	[733]
†399	†436*b*	§480*a*	†530	†582	[631]	681	§733*a*
*[399*a*]	*436*c*	§480*b*	†531	§583	†632	†682	†734
†400	*436*d*	†481	†532	†584	†633	†683	§735
†401	*437	*481*a*	[533]	†585	†634	*684	†736
§402	*438	482	†534	[586]	*635	§685	*727
†402*a*	§439	§483	*535	[587]	†636	686	†738
†402*b*	†439*a*	†484	†536	†588	§637	687	†739
*402*c*	†440	*485	†537	†589	†638	§688	§740
†402*d*	*441	§486	§538	*590	†639	†689	†741
*403	442	§487	[539]	†591	§640	690	§742
†404	†443	[488]	†539*a*	*591*a*	†641	§691	§743
†405	†444	§489	†[540]	*592	†642	*692	†743*a*
†405*a*	†445	†490	†541	[593]	§643	693	†744
†405*b*	*446	†491	†541*a*	§593*a*	†643*a*	[694]	†745
†405*c*	§447	§492	†542	§594	†643*b*	§695	†746
†406	†448	§493	†543	§594*a*	†644	†696	†747
†407	†449	§494	†544	§594*b*	†645	†697	†748
†[407*a*]	*450	§495	†545	*594*c*	†646	†698	*749
§408	†451	†496	[546]	*595	†646*a*	§699	†750
†408*a*	†452	§497	[547]	§596	†647	*700	†751
*409	†453	§498	†548	[597]	*648	†701	†752
*410	§454	*499	†549	†598	§649	†[702]	†753
*411	†455	†500	†550	†599	†650	*703	*754
†412	†456	§501	[551]	*600	†651	*704	*755
†412*a*	†457	†502	§552	601	†652	†705	*756
†412*b*	†458	†503	*553	†602	†653	†705*a*	*757
†412*c*	†459	§504	[554]	†603	†654	†705*b*	†758
†413	†460	†505	§555	†604	†655	*706	†759
†414	†461	[506]	§556	†605	§656	*707	§760
†414*a*	†462	†407	§557	[606]	*657	*[708]	§761
*415	†463	†508	†558	607	§658	*709	*762
[416]	§464	†509	†559	†608	§658*a*	*710	§763
†417	§465	†510	†560	†609	§659	†[711]	763*a*
*417*a*	†466	*511	[561]	§610	§660	†712	764
*418	*467	[512]	[562]	[611]	§661	†713	†764*a*
*419	*468	†513	563				

[Proceedings United States National Museum, 1884. Appendix.]

SMITHSONIAN INSTITUTION.

UNITED STATES NATIONAL MUSEUM.

No. 31.

PLAN TO ILLUSTRATE THE MINERAL RESOURCES OF THE UNITED STATES AND THEIR UTILIZATION, AT THE WORLD'S INDUSTRIAL AND COTTON CENTENNIAL EXPOSITION OF 1884–1885, AT NEW ORLEANS.

BY FRED. P. DEWEY,

Curator of Economic Geology and Metallurgy.

In the first division of this collection—that of Economic Geology, or the natural occurrence of materials of economic value—it is designed to exhibit collections illustrating the different kinds and grades of the ores of each metal, and also a few collections of non-metallic minerals of economic importance.

In the second division—that of Metallurgy—it is designed to exhibit collections representing the processes for the extraction of the metals from their ores by specimens, where practicable, filling the gaps by means of illustrations and descriptions and accompanying them by general illustrations and descriptions so as to fully explain these processes.

In making up the ore collection it has been designed to represent all the different varieties of each ore and many of the most prominent mining regions, so as to give a good general idea of the nature of the occurrences of the metals and also their distribution, but it has not been possible to show every occurrence of each variety of an ore, neither has it been possible to represent every mining region.

The Lake Superior copper region is very thoroughly represented, both on account of the value of the mines of this region and as representing the kind of collections it is desirable for the Museum to possess to illustrate a region or a mine.

Taking, first, the region, it is represented by three prominent mines showing three different and characteristic occurrences of the ore.

First, the so-called Mass mines, which are characterized by the occurrence of large masses of free copper, amounting in some cases to many tons of metal in a single mass, are represented by the Central mine.

Besides these large masses these mines also carry considerable disseminated free copper.

Second, the Amygdaloid mines, which are characterized by the occurrence of the free copper in amygdules, bunches, strings, and sheets from the size of a pin-point up to a few hundred pounds in weight (with rarely a large mass) disseminated in a soft amygdaloid trap-rock, are represented by the Osceola mine.

The average percentage of copper in the ores from these mines varies from three-quarters of 1 per cent. to 2 per cent.

Third, the Conglomerate mines, which are characterized by the occurrence of the free copper mostly in strings in a hard conglomerate of ferruginous quartz pebbles, are represented by the Conglomerate mine. The average percentage of copper in the ores from these mines varies from 4 per cent. to 6 per cent.

Taking the Conglomerate mine, the collection shows, first, the general character of the ore and the inclosing wall rocks; secondly, it shows the occurrence of the ore at various prominent points in the mine which are accurately located; and, thirdly, it shows a section of the rocks over a distance of 631 feet, by specimens taken at suitable distances to show the different characters and changes of the material.

In selecting specimens it has not been designed to take those that are especially handsome or rich, but rather to take such as represent the actual character, occurrence, and value of the ores. In making collections of ores for the National Museum, it is very desirable that some definite and systematic plan of representation of this kind should be adopted, as collections made in this way have far more value for Museum purposes than the hap-hazard collections of showy specimens usually found in such establishments.

COLLECTIONS IN ECONOMIC GEOLOGY.

Gold.

Placer gold, from Virginia, North Carolina, California, Idaho, Montana, Utah, and Oregon.

Gold quartz from Virginia, North Carolina, South Carolina, Georgia, California, and Montana.

Auriferous gravel, from California and South Carolina.

Auriferous pyrite from Virginia and Colorado.

Telluride ores—compounds of gold with tellurium from Colorado.

Iridium.

Iridosmine, from California.

Silver.

Native silver with native copper, from the Lake Superior region.

Native silver on sulphide of copper, from Montana.

Wire silver, from Nevada, Montana, Idaho, and New Mexico.

Native silver and horn silver, in sandstone, from Utah.

Horn silver, from Colorado, Utah, Nevada, and New Mexico.

Ruby silver, from Nevada.

Base ores carrying silver (milling ores), from Nevada, Utah, and Montana.

Argentiferous lead ores (smelting ores), from Colorado, Utah, and Nevada.

Tin.

On account of recent discoveries and the general interest attaching to tin, the list of the localities of the occurrence of cassiterite, or the binoxide of tin, has been made as complete as possible, and includes Maine, New Hampshire, Virginia, North Carolina, Alabama, Montana, and the Black Hills of Dakota. The tin ore of San Jacinto, Cal., is also shown.

With the tin ores are shown bars of tin reduced from the New Hampshire (1840), Virginia, Alabama, Montana, and California ores; also a collection of Welsh tin-plate.

Antimony.

The sulphide ores from Utah (with metal) and California.

Quicksilver.

Cinnabar, from California.

Lead.

The sulphide ores from Missouri. (For argentiferous lead ores, see under Silver).

Copper.

Native copper, from Lake Superior region in Michigan, including—water worn or surface specimens; specimens of the mass copper, and chips obtained in cutting up the masses in the mine; and specimens showing the disseminated free copper in the rock, both amygdaloid and conglomerate. To these are added specimens illustrating the dressing of the ores.

Sulphide ores, including the sulphides of copper and iron, from Vermont, Maryland, North Carolina, and Missouri, and the sulphide of copper from Butte, Montana.

Oxidized ores, from Pennsylvania, Virginia, and Arizona.

Bismuth.

The oxidized ores from Utah.

Nickel and cobalt.

The sulphide ores from Pennsylvania and Missouri.

Iron.

A collection of ores of over 500 specimens, selected from the collections made by the Tenth Census, under the direction of Prof. R. Pumpelley, to illustrate the iron industry of the United States, showing all the different kinds and varieties of iron ore found in this country.

This collection is not intended to show the full occurrence in any one region, but only the prominent varieties of the different regions.

Manganese.

Manganese ore from Virginia and Georgia.

Zinc.

The New Jersey ores, including Franklinite, Zincite, Willemite, and Calamine.

The silicate and carbonate ores of Tennessee and Virginia.

The sulphide ores of Missouri and Kansas.

Coal.

A collection showing the different varieties of coal from Pennsylvania and Virginia, including anthracite, semi-bituminous, bituminous, splint and cannel coal; also a large collection illustrating the methods of coal mining, including some large photographs (taken by electric light) of the interior of a coal mine, showing the formation of the coal-seam and its peculiarities, together with the men at work. These are the first photographs ever taken of the interior of a coal mine.

Sulphur.

Native sulphur from Nevada.

Iron pyrites from Massachusetts and Virginia.

Besides the above systematic ore collections, some illustrations of ores will be found in the metallurgical collections.

In making up the metallurgical collection it has not been possible to exhibit the production of each metal exhaustively, owing to the small amount of suitable material previously in the department, and to the short space of time available for making new collections.

A few systematic illustrations of metallurgical operations are shown. In making these collections it has been designed to treat a few subjects thoroughly rather than a large number superficially. After suitable consideration a few representative works were selected for illustration, and have been worked up as completely as possible.

Beginning with the ore as mined, each step in its preparation for smelting is shown, together with the by or waste products of such treatment. To illustrate the smelting operation the ores, the fuels, the fluxes, and every other material entering into the operation are shown. Following through the process, each product of each operation up to the final product of the works is represented; to these are added, where

practicable, illustrations of materials of construction, such as fire-clays, sands, &c. The furnaces and tools are shown by specimens, views, and descriptions. The interest and value of these collections does not lie so much in the specimens themselves as in their being thoroughly connected, and in the kind and amount of information that can be given in regard to them.

In order to be satisfactory the series must be complete, and the information full and accurate. A great deal of time, care, and attention is necessary in making such a collection.

To illustrate the nature and scope of these collections, a single one, that from the Passaic Zinc Works, will be described in detail. These works are located at Jersey City, N. J., and use the zinc, iron, and manganese ores from Franklin, Sussex County, New Jersey; they were started in 1854, and have been twice enlarged.

From 1854 to 1875 only oxide of zinc was manufactured; in 1875 the spelter furnaces were added, and in 1884 the spiegel furnace. The works have been in constant operation from the very beginning.

There are 48 furnaces, 6 by 4 feet, making oxide of zinc, arranged in double rows of 8 and 10. There are 12 spelter furnaces arranged in blocks of 4 each. The spiegel plant consists of one 9 feet 8 inches by 37½ feet blast furnace.

The Franklinite ores are treated first in the oxide furnaces for the production of oxide of zinc and the residues containing iron and manganese are smelted in the blast furnace for the production of spiegel.

The silicate and carbonate ores are smelted in the spelter furnaces for the production of metallic zinc.

The collection from the zinc furnaces shows—

The Franklinite ore, consisting of a mixture of Franklinite or protosesquioxide of iron with zinc and manganese replacing the iron, Zincite or oxide of zinc, Willemite or silicate of zinc, Calcite or carbonate of lime, in lumps as mined, from the Buckwheatfield mine, Franklin, Sussex County, New Jersey.

The same ore crushed ready for the furnace.

The Franklinite ore, consisting of a mixture of Franklinite or protosesquioxide of iron with zinc and manganese replacing the iron, Zincite or oxide of zinc, Willemite or silicate of zinc, Rhodonite or silicate of manganese, and Calcite or carbonate of lime, in lumps, as mined from the Sterling Hill mine, Ogdensburg, Sussex County, New Jersey.

The same ore crushed ready for the furnace.

The silicate and carbonate ore, consisting principally of calimine or hydrated silicate of zinc with a little carbonate of zinc resulting from decomposition, in lumps, as mined from the Sterling Hill mine, Ogdensburg, Sussex County, New Jersey.

The same ore after roasting to expel water and carbonic acid.

The roasted ore crushed ready for the furnace.

Anthracite coal used for heating purposes.

Anthracite coal (fine) to be mixed with the ore in making up the charge to reduce the zinc to the metallic state.

The mixed charge of Franklinite ore and coal ready for the oxide furnace.

The mixed charge of silicate and carbonate ore for the spelter furnaces.

The residuum remaining in the oxide furnace after the extraction of the zinc.

The oxide of zinc produced.

The residue remaining in the retorts after the distillation of the zinc in the spelter furnaces.

Blue powder, a by-product consisting of a mixture of metallic zinc and oxide resulting from imperfect condensation of the zinc.

The spelter or metallic zinc produced.

To these are added the fire-clay from Woodbridge, N. J., used for making retorts.

A piece of new retort.

A piece of old retort.

Old retort ground, to be mixed with the clay in making new retorts.

The collection from the spiegel furnaces shows—

The residuum from the oxide furnaces, containing iron and manganese.

Limestone used for flux from Sing Sing, N. Y.

Anthracite coal used for fuel.

The slag produced.

Oxide of zinc deposited in the gas-flues.

The spiegeleisen produced.

The collection of specimens is supplemented by photographic views of the principal points about the works.

COLLECTIONS IN METALLURGY.

Gold.

The extraction of the free gold from the auriferous gravel of California by amalgamation: Collection from the North Bloomfield mine, Nevada County, California.

The extraction of the free gold from the auriferous pyrite in quartz of Colorado, by stamping and amalgamating: Collection from the Bobtail mill, Black Hawk, Gilpin County, Colorado.

The extraction of gold from the auriferous mispickel (arsenical pyrites) by roasting and chlorination: Collection from the Del Oro Works, Canada.

The extraction of gold and copper from auriferous copper ores, by the fusion and electrolitic process: Collection from the works of E. Balbach & Son, Newark, N. J.

The manufacture of gold leaf: Collection from Hastings & Co., Philadelphia, Pa.

Silver.

The extraction of silver from base ores by chlorodizing roasting, and milling (amalgamation): Collection from Ontario mill, Park City, Summit County, Utah.

The smelting of argentiferous lead ores and the refining of the base bullion (silver and lead): Collection from the Cheltenham Works, Saint Louis County, Missouri.

The refining of base bullion (silver and lead): Collection from the works of E. Balbach & Son, Newark, N. J.

Lead.

The manufacture of pig lead and white lead direct from the ore: Collection from the Lone Elm Works, Joplin, Mo.

Copper.

The smelting and refining of copper by the fusion process: Collections from the Baltimore Copper Works, Baltimore, Md., and Saint Genevieve Copper Works, Saint Genevieve, Mo.

The refining of pig copper: Collection from the Ansonia Brass and Copper Works, Ansonia, Conn.

The rolling of copper: Collection from the Ansonia Brass and Copper Works, Ansonia, Conn.

Iron.

The smelting of pig iron: Collections from the Crown Point furnace, Crown Point, N. Y., the Rockwood furnace, Rockwood, Tenn., and the Missouri furnace, Saint Louis, Mo.

Steel.

The manufacture of crucible steel: Collection from the Crescent Steel Works, Pittsburgh, Pa.

The manufacture of Bessemer steel: Collection from the South Chicago Bessemer Works, South Chicago, Ill.

Zinc.

The smelting of spelter or zinc: Collections from the Glendale Zinc Works, Saint Louis, Mo., the Joplin Zinc Works, Joplin, Mo., and the Rich Hill Zinc Works, Rich Hill, Mo.

Zinc, iron, and manganese.

The smelting of spelter or zinc, oxide of zinc, and spiegeleisen from Franklin, N. J., ores: Collection from the Passaic Zinc Works, Jersey City, N. J.

Coke.

The manufacture of coke at Connellsville, Pa.: Collection from the H. C. Frick coke ovens.

Sulphur.

The manufacture of sulphuric acid from iron pyrites: Collection from the Merrimac Chemical Company, Boston, Mass.

The manufacture of alloys.

Brass and its utilization: Collection from the Ansonia Brass and Copper Works, Ansonia, Conn.

Type metal and its utilization: Collection from the type foundry of Mackellar, Smiths & Jordan, Philadelphia, Pa.

Babbitt, or anti-friction metals: Collections from Merchant & Co., and Paul S. Reeves, Philadelphia, Pa.

Solders: Collection from Merchant & Co., Philadelphia, Pa.

COLLECTIONS ILLUSTRATING THE PRACTICAL APPLICATION OF NON-METALLIC ORES.

The manufacture of sand-paper: Collection from Baeder, Adamsom & Co., Philadelphia, Pa.

Asbestos and its application: Collection from the H. W. Johns Company, New York.

Abrading and polishing materials: Collections from R. J. Waddell & Co., New York, and Saint Louis Tripoli Company, Saint Louis, Mo.

The utilization of barites: Collection from Page & Krause, Saint Louis, Mo.

WASHINGTON, D. C., *December* 14, 1884.

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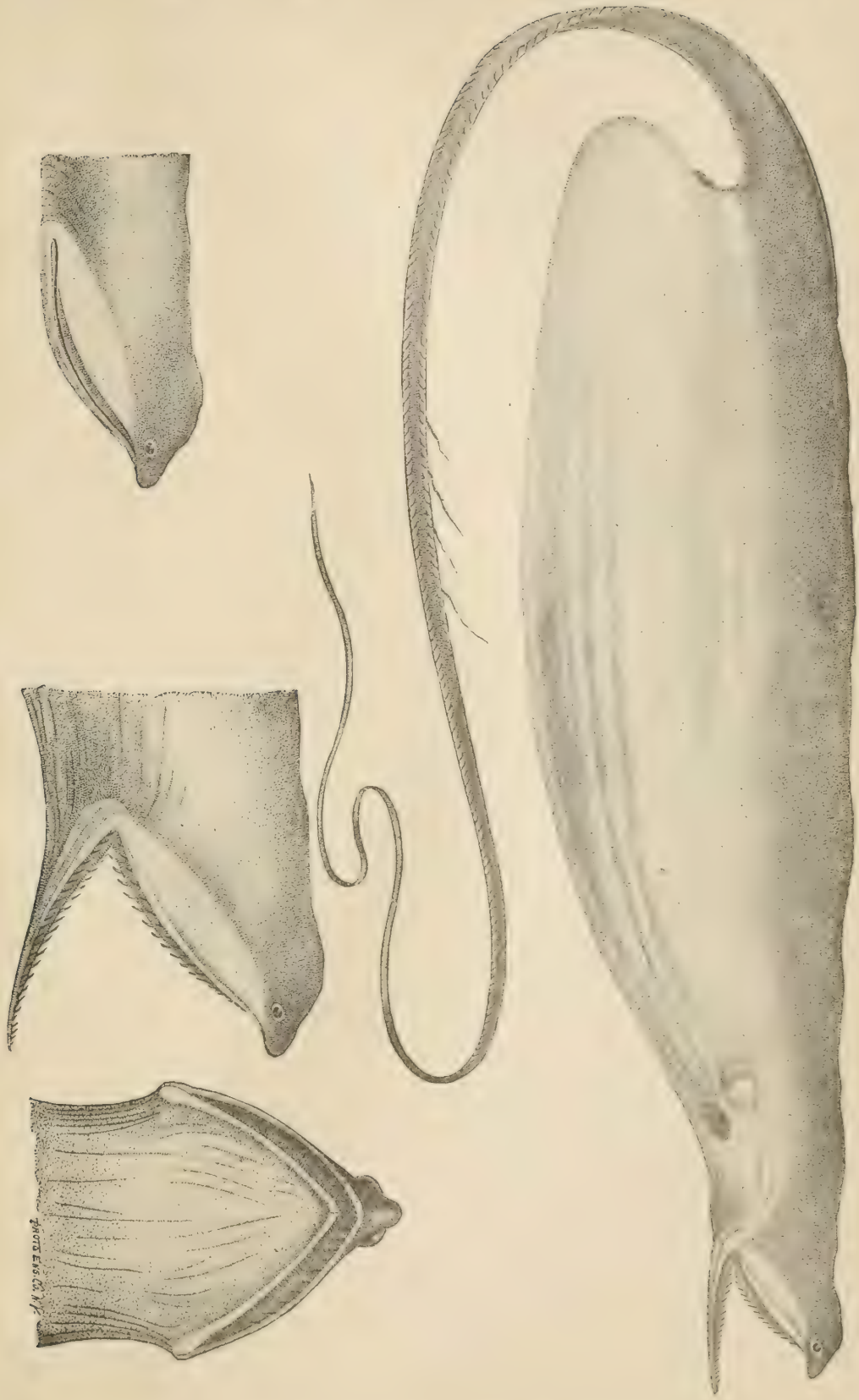
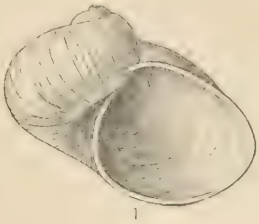


OPHIOGNATHUS AMPULLACEUS (ex Harwood).

PLATE II.

FIGS. 1–3.—*Lacunella reflexa* Dall, n. s. (Description, pages 344, 345.)
FIG. 4.—*Cerithiopsis stejnegeri* Dall, n. s. (Description, pages 345, 346.)
FIG. 5.—*Strombella callorhina* Dall, var. *stejnegeri*. (Description, pages 346, 347.)
FIG. 6, referred to on page 346, not printed.)
(FIG. 7, *Sternoptyx*, referred to on pages 349, 351, not printed.)
FIG. 8.—*Bela murdochiana* Dall, n. s. (Description, page 524.)



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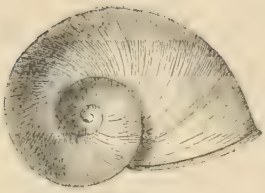

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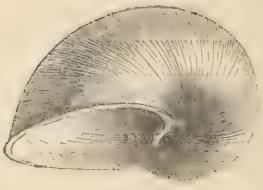

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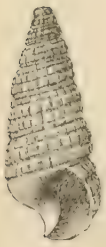

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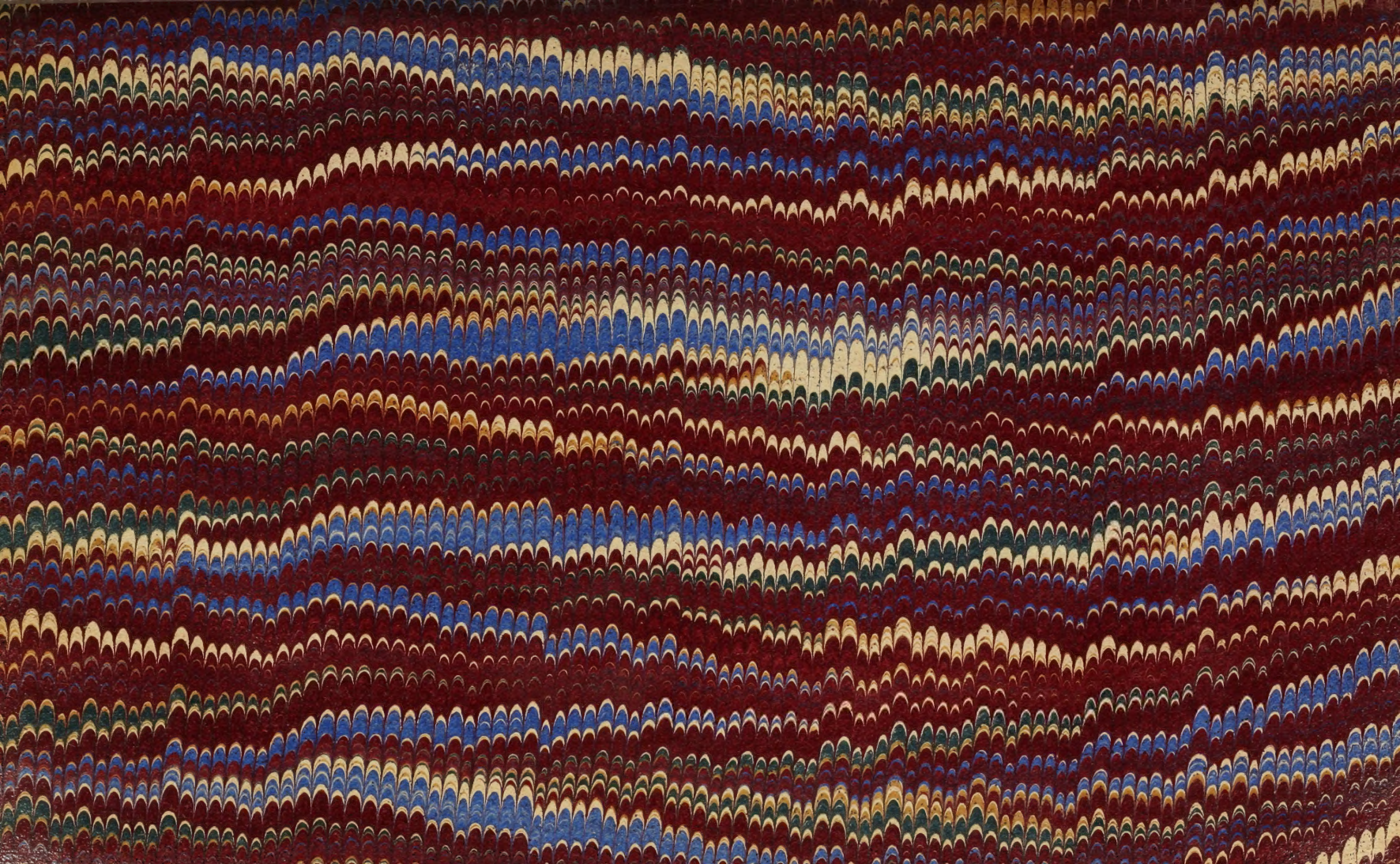

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